MEAT INSPECTORS MANUAL

POULTRY

DIRECTORATE: VETERINARY SERVICES

VETERINARY PUBLIC HEALTH

NATIONAL DEPARTMENT OF AGRICULTURE

REPUBLIC OF SOUTH AFRICA

JANUARY 2007

FOREWORD

The delivery of meat hygiene services in South Africa has gone through various phases of change since the function was officially made the responsibility of the Department of Agriculture in the early 1960's. Little did we realise when the first Animal Slaughter, Meat and Animal Products Act, 1967 (Act No. 87 of 1967) was published in 1967, what challenges would lie ahead 40 years later. We have seen the third Act related to the delivery of meat hygiene services promulgated by Parliament. The Meat Safety Act 2000 (Act 40 of 2000), has replaced the Abattoir Hygiene Act (Act 121 of 1992) signifying, not only by the change in names of the relevant Acts since 1967 but also in the objectives of the Act, the obligation of Government to react to the needs of its clientele and to address the concerns of consumers.

The emphasis on the delivery of services as reflected in consecutive legislation since 1967, has changed gradually from a structural and process-control approach of service delivery, to a holistic approach with the focus on food safety. Growing international concern that the State should be the custodian on all matters related to food safety and provides the sanitary guarantees required by consumers and our trade partners, necessitated a change of focus on the delivery of these services. We are confident that these manuals will guide and enable all those responsible for the delivery of a meat safety service, to focus on the new challenges and to claim ownership of the initiative to establish a culture of hygiene awareness.

Over the last 40 years many teams and co-workers collected and collated material for training future meat inspection staff. This was made available to all tertiary training institutions free of charge in order to ensure that the minimum standards proposed by this Directorate would be known to all. During 2006 the task of updating, co-ordinating and maintaining this intellectual property of the Department of Agriculture, was given to Dr. T. Bergh from the Limpopo Province. All the persons involved in this work, are congratulated with what eventually emerged after many months of hard and dedicated work.

There is no doubt that this manual, being dynamic and reflecting change, will serve as a benchmark for the future to enable the delivery of meat safety services to be accessible and affordable for all.

Maja.

DR. M. MAJA
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PRETORIA, JANUARY 2007

INTRODUCTION

The Directorate Veterinary Services of the National Department of Agriculture was constitutionally tasked ensure that norms and standards concerning abattoir hygiene be implemented uniformly on a national basis.

Since the Department is the custodian of the “Meat Safety Act” (Act 40 of 2000) it is fitting that the Department set the standards required for meat inspection personnel.

It was decided to write a manual containing a minimum norm of required knowledge for all persons involved with meat hygiene in abattoirs as well as doing meat inspection.

With the necessary adaptation, these manuals can thus be used over a wide spectrum of training requirements and should be in the possession of all persons involved with meat inspection and hygiene-control in an abattoir.

The final manuals, after various versions, have now been revised and have been blended in such a way as to enhance a smooth transition from the basic concepts of food safety management systems, applicable to all meat disciplines, to a more specific approach for the specific disciplines.

The manuals are drafted to address the following concepts:

- Abattoir hygiene

This manual highlights the international principles of food safety management systems e.g.

- Basic microbiology
- Building requirements
- Sanitation
- Pest control
- Personnel hygiene
- Waste management & control of condemned material
- Quality control

The follow up manuals in the respective disciplines of red meat, poultry, game, ostrich & crocodile deals with the requirements specific to the trade e.g.

- Specific building requirements
- Process control
- Anatomy
- Pathology
- Diseases
- Meat inspection

A special word of thanks to all who helped redrafting these final manuals and all the hours of hard work put in to have them available for the New Year.

EDITOR:

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MEAT INSPECTORS MANUAL
POULTRY

PART II
MEAT INSPECTION

MODULE I

ABATTOIR LAYOUT AND CONSTRUCTION
SPECIFIC REQUIREMENTS FOR POULTRY ABATTOIRS & CUTTING PLANTS

INDEX

Abattoir Layout and Construction

Specific requirements for poultry abattoirs

1. Introduction

Over and above the general requirements that are specified in the module “Layout & Construction”, every specific meat trade has it’s own requirements that enhance the hygienic production of that specific type of meat. Abattoirs have its own specific design that will enable the workers to slaughter and dress the carcass hygienically and that will promote easy working conditions to reduce stressful working conditions that will result in unacceptable practices in the work place.

Regulations have been promulgated to ensure that the layout of the building will enhance the easy handling of carcasses and that acceptable practises are adhered to.
This module will guide you through the specific requirements needed for red meat abattoir, its cutting plants and how the process of slaughter and dressing should be done to ensure a safe and hygienic product

2. Throughput and other requirements for grades

2.1 Requirements for rural poultry abattoirs

Considering the requirements set out in Part II B (1) for an abattoir to be graded as a rural poultry abattoir –

(a) the throughput may not exceed fifty units per day;
(b) the premises must be fenced and provided with a gate to control access of people and animals;
(c) a roofed offloading and holding area for live birds must be provided;
(d) it must consist of at least one room, equipped with a dressing rail, in which all the functions regarding the slaughtering and dressing of poultry can be performed hygienically;
(e) if windows are not glazed fly screens must be provided;
(f) doors must be provided –
    (i) where birds enter the abattoir;
    (ii) where carcasses and offal are dispatched; and
    (iii) above mentioned may be the same door if the process is separated by time;
(g) the abattoir must be provided with conveniently placed boot wash and hand wash facilities;
(h) a sterilizer adjacent to a hand wash-basins must be provided;
(i) toilet and hand wash facilities must be provided;
(j) facilities to store items needed in the daily slaughter process must be provided;
(k) the design of the abattoir must allow for future upgrading of the facility; and
(l) chilling facilities to accommodate at least the daily throughput must be provided and the proximity of these facilities must be such as not to compromise hygiene standards and be acceptable to the provincial executive officer.

2.2 Requirements for low throughput poultry abattoirs

Considering the requirements set out in Part II B(1) and (2), for an abattoir to be graded as a low throughput poultry abattoir –

(a) a maximum throughput of two thousand units per day may not be exceeded, provided that the provincial executive officer may determine a lower maximum throughput for an abattoir on grounds of the hourly throughput potential relative to available equipment and facilities as well as chilling capacity;

(b) premises must be fenced and provided with a gate to control access of people and animals;

(c) roofed facilities for offloading and holding of live birds must be provided;

(d) a facility where poultry transport trucks must be sanitized after offloading must be provided;

(e) an equipped room must be available, but if throughput exceeds 100 units per day separate rooms inter-connected by means of hatches only must be available, where –

  (i) poultry is stunned, bled, scalded, defeathered, heads and feet are removed, rough offal is dispatched and meat inspection is done;

  (ii) carcasses are eviscerated, washed, meat inspection is done and where separate facilities must be provided for further inspection and recovery;

  (iii) carcasses are portioned, packed and chilled and meat and red offal are dispatched provided that where the daily throughput is less than 300 birds, this function may be done in the room mentioned in (ii) and where the throughput exceeds 500 birds the air temperature of this room may not exceed $12^{o}C$;

  (iv) rough offal is handled, provided that this may be done in a separate area in (ii);

(f) facilities must be provided where feathers and inedible products can be kept under hygienic conditions prior to removal from the abattoir, unless it is removed on a continuous basis;

(g) separate chillers and freezers must be provided for the daily throughput of –

  (i) carcasses, red offal; and

  (ii) washed rough offal;

(h) a personnel entrance to the clean areas of the abattoir must be provided and must be designed as an ante-chamber for cleaning purposes and must be provided with hand wash-basins, soap dispensers, hand drying facilities, a boot wash, apron wash, hooks for aprons and a refuse container and at the discretion of the provincial executive officer, personnel entrances to other areas of the abattoir need not be provided with an ante-chamber but must be provided with conveniently placed boot wash and hand wash facilities at the entrance to such areas;

(i) change room, shower, toilet as well as hand wash-facilities must be provided on the premises for persons working at the abattoir;

(j) dining facilities must be provided with tables and chairs and must be situated so that personnel do not sit or lie on the ground or soil their protective clothing during rest periods;

(k) a storage facility or room for items needed in the daily slaughter process must be provided;

(l) if an office is required by the owner, a separate room must be provided;

(m) rooms or facilities must be provided for –

(i) storage of cleaning equipment and materials;

(ii) cleaning and sterilization of fixed and movable equipment; and

(iii) sterilization of product crates and storage thereof; and

2.3 Requirements for high throughput poultry abattoirs

Considering the requirements set out in Part II B (1) and (2) for an abattoir to be graded as a high throughput poultry abattoir –

(a) it must have a maximum throughput which the provincial executive officer may determine on grounds of the hourly throughput potential relating to available equipment and facilities as well as chiller capacity;

(b) the premises must be fenced to control access of people and animals and provided with separate gates for clean and dirty functions;

(c) the abattoir and premises must be designed to separate dirty and clean areas and functions;

(d) roofed facilities for off-loading and holding live birds must be provided;

(e) a facility where poultry transport trucks must be sanitised after offloading must be provided;

(f) rooms with clean functions and those with dirty functions may only be interconnected by means of hatches and/or chutes;

(g) the stunning and bleeding area must be physically separated from any other work areas;

(h) separate rooms, where applicable, inter-connected by means of hatches only, must be provided where –

(i) poultry is scalded, defeathered, heads and feet are removed and meat inspection is done;

(ii) feathers are collected, placed in containers and kept till removal;

(iii) dry de-feathering and down recovery is performed if so required;

(iv) wax is recovered and stored if so required;

(v) carcasses are eviscerated, red offal is cleaned and meat inspection is done;

(vi) rough offal is handled, washed, packed, chilled and loaded;

(vii) carcasses are detained for further inspection and recovery, where no separate and approved areas exist in (v) to carry out such functions;

(viii) condemned carcasses and material are kept before removal from the abattoir, provided that if the condemned material is removed on a continuous basis during production or a separate dedicated chiller is available for condemned material, such a room is not required;

(ix) separate hand wash, boot wash and apron wash facilities directly connected to the condemnation area, must be provided for persons who handle condemned products referred to in subparagraph (viii);

(x) carcasses are portioned, cut and meat, including red offal, is wrapped;

(xi) in-contact wrapping material, for daily use, is stored;

(xii) wrapped meat is packed;

(xiii) packing material (cartons), for daily use, is stored;

(xiv) cleaning equipment for the daily operation of the abattoir is stored; and

(xv) meat and red offal are sorted and dispatched and the air temperature in this area must not be more than 12°C when meat is handled and dispatched and the dispatching doors must be such that the doors of the vehicles will only be opened after docking;

(i) separate chillers must be provided, for the daily throughput, for –

(i) chilled or frozen carcasses and poultry meat products as well as red offal; and

(ii) chilled or frozen rough offal if required;

(j) a personnel entrance to the clean areas of the abattoir must be provided and must be designed as an ante-chamber for cleaning purposes and must be provided with hand wash-basins, soap dispensers, hand drying facilities, a boot wash, apron wash, hooks for aprons and a refuse container and at the discretion of the provincial executive officer, personnel entrances to other areas of the abattoir need not be provided with an ante-chamber but must be provided with conveniently placed boot wash and hand wash facilities at the entrance to such areas;

(k) change room, shower, toilet as well as hand wash facilities must be provided on the premises for persons working at the abattoir and separate facilities must be provided for clean an dirty areas;

(l) dining facilities must be provided separately, for clean and dirty areas, with tables and chairs or benches and must be situated so that personnel do not sit or lie on the ground or soil their protective clothing during rest periods;

(m) office accommodation and ablution facilities must be available for meat inspection personnel;

(n) a store room must be provided for items needed in the daily slaughter process;

(o) office facilities must be separate from bleeding and dressing areas;

(p) suitably equipped rooms and facilities must be provided for sterilization of movable equipment;

(q) a room or rooms for bulk storage of cleaning equipment and chemicals must be provided;

(r) separate bulk storage facilities must be provided for wrapping material and packing material, if both materials are kept;

(s) a storage room for cleaned crates must be provided adjacent to a crate receiving and cleaning facility and directly interconnected to the rooms and areas where needed;

(t) a facility where meat transport trucks must be sanitized must be provided; and

(u) access to a laboratory must be possible.

2.4 Requirements for high throughput cutting plants

Considering requirements set out in Part II B (1), to be graded as a high throughput cutting plant –

(a) it must have a maximum throughput which the provincial executive officer may determine on grounds of the capacity of the holding chillers, hourly throughput potential relating to available equipment and facilities as well as chiller or freezer capacity;

(b) the premises must be fenced and provided with a gate to control access of people and animals;

(c) if meat is intended for sale to the public, separate facilities must be provided as required by the provincial executive officer.

(d) separate equipped rooms must be provided for –

(i) receiving of unwrapped carcasses and meat intended for cutting;
(ii) receiving of cartonned meat intended for cutting;
(iii) removal of meat from cartons and wrapping and thawing where applicable;
(iv) cutting and wrapping at an air temperature below 12 °C;
(v) packing, marking and labelling at an air temperature below 12 °C;
(vi) making up of new cartons used for packing meat;
(vii) dispatching of wrapped and packed meat at an air temperature below 12 °C;
(viii) dispatching of unwrapped carcasses and meat at an air temperature below 12 °C; and
(ix) washing and sterilizing of equipment.;

(e) separate bulk storage facilities or rooms must be provided for –
(i) wrapping material; and
(ii) packing material;

(f) separate storage facilities or rooms must be provided for items in daily use, such as –
(i) hand equipment;
(ii) wrapping material;
(iii) clean protective clothing; and
(iv) cleaning materials and chemicals;

(g) separate chillers or freezers must be available for –
(i) unwrapped carcasses and meat;
(ii) packed meat;
(iii) holding frozen meat if required; and
(iv) blast freezing meat if required;

(h) ablution facilities and toilets must be provided and the access routes to the cutting room must be under roof;

(i) a personnel entrance to the clean areas of the plant must be provided and must be designed as an ante-chamber for cleaning purposes and must be provided with hand wash-basins, soap dispensers, hand drying facilities, a boot wash, apron wash, hooks for aprons and a refuse container and at the discretion of the provincial executive officer, personnel entrances to other areas of the plant need not be provided with an ante-chamber but must be provided with conveniently placed boot wash and hand wash facilities at the entrance to such areas;

(j) sterilizers with water at 82°C must be provided or, as an alternative, a valet system where handheld equipment are collected on a regular basis and sterilized in a central sterilizing facility may be used, with the understanding that strategically placed emergency sterilizers are still required;

(k) extraction facilities for vapour control must be provided; and

(l) further processing must comply with the requirements set in the Requirements for Food Premises under the Health Act.

3. Holding and offloading

Offloading facilities for live birds must include a roofed and well ventilated area for –

(a) trucks waiting to offload; and

(b) crates with birds which have been offloaded and are awaiting slaughter.

4. Stunning and bleeding

(1) Facilities for stunning birds must be provided –

(a) in case of hand lines, a manual electrical stunning apparatus; and

(b) in case of mechanical lines, a separate stunning and bleeding line which conveys the birds through an electrified water bath.

(2) A bleeding tunnel in the case of mechanical lines, bleeding cones in the case of hand lines as well as containers, tanks for storage of blood prior to removal and disposal, must be provided.

5. Scalding and de-feathering

(1) Facilities must be provided for scalding of carcasses by immersion of the entire carcass in hot water prior to de-feathering –

(a) in case of manual lines, facilities with a capacity of at least 20 litres of hot water; and

(b) in case of mechanical lines, a system which moves the carcasses through a scalding tank with hot water and the design of the scalding tank must provide for continuous addition of hot water at a flow of at least 1 litre per bird.

(2) Mechanical de-feathering machines must be provided for removing feathers.

(3) If feathers are removed dry, a separate room must be provided which –

(a) is adequately ventilated and closed off to avoid feather dust from entering the evisceration area; and

(b) is equipped with facilities to receive and handle feathers.

(4) A carcass washer, using water which may contain a bactericidal substance, which complies with the requirements of the Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act No. 54 of 1972) and is approved per protocol by the provincial executive officer, at levels not harmful or injurious to health, must be available to wash carcasses before evisceration.

6. Meat inspection

(1) Equipment required for the first meat inspection point must be provided.

(2) At the second inspection point, after evisceration, containers to transport partially condemned carcasses to the recovery area must be provided

(3) Marked, leak proof and theft proof containers or other means to handle and hold condemned and inedible material prior to removal must be provided.

(4) Equipment required for the final meat inspection point must be provided.

7. Evisceration

(1) An evisceration line with shackles must be provided to enable evisceration in a hanging position.

(2) Evisceration trays or a trough or conveyor belt must be provided beneath the carcass line to receive intestines and be equipped to facilitate continuous rinsing.

(3) Mechanical evisceration equipment must –

(a) be capable of eviscerating carcasses without rupturing the intestines;

(b) be continuously self-cleaning; and

(c) be capable of adjusting to different carcass sizes.

(4) Hand evisceration facilities must comprise of –

(a) eviscerating spoons capable of removing intestines without rupturing intestines;

(b) hand wash facilities within reach of operators; and

(c) line space for the number of operators required.

8. Recovery

Facilities for recovering usable portions from detained carcasses must be provided, if required, and must include –

(a) hand wash-basins;

(b) sterilizer for equipment;

(c) equipment for cutting and recovery of portions;

(d) equipment for washing with water which may contain a bactericidal substance, which complies with the requirements of the Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act No. 54 of 1972) and is approved per protocol by the provincial executive officer, at levels not harmful or injurious to health or other approved washing method for recovered portions; and

(e) marked, leak proof and theft proof containers or other means to handle and hold condemned and inedible material prior to removal.

9. Final Wash

Equipment for the inside and outside wash of the carcasses, after evisceration, which must be with water which may contain a bactericidal substance, which complies with the requirements of the Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act No. 54 of 1972) and is approved per protocol by the provincial executive officer, at levels not harmful or injurious to health, must be provided.

10. Primary Carcass chilling

(1) Pre-chilling or in-process chilling facilities must be capable of chilling carcasses to below 10 ^{o}C.

(2) Separate chilling facilities must be provided to pre-chill recovered portions to below 10 ^{o}C.

11. Portioning and packing

Equipment must be provided for portioning and packing of carcasses as required by the Provincial Executive Officer.

12. Chilling and freezing

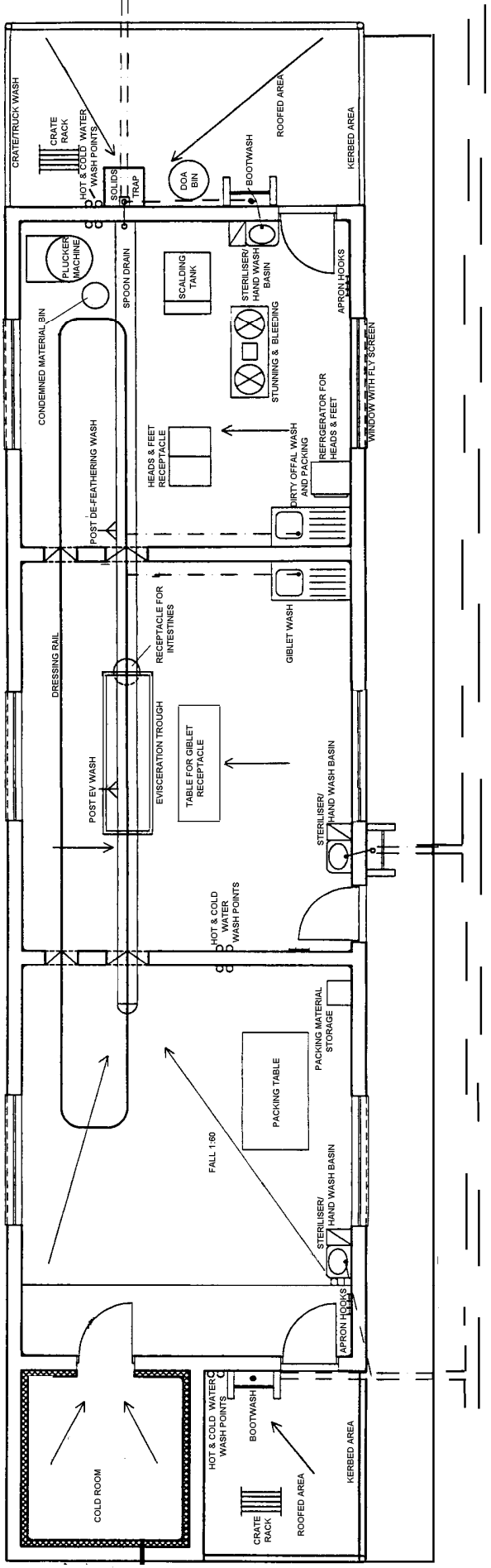
Sufficient chillers and freezers must be provided for final chilling, freezing and storage of packed products –

(a) Chilled poultry at 4 ^{o}C; and

(b) Frozen poultry at minus 12 ^{o}C

3. EXAMPLES OF BUILDING PLANS

POULTRY C- GRADE ABATTOIR



MEAT INSPECTORS MANUAL
POULTRY

PART II
MEAT INSPECTION

MODULE 2

PROCESSING

Index

Poultry Processing

PROCESSING

1. INTRODUCTION

Poultry processing consist of a number of steps. Each step is followed by the next in strict sequence. Each step entails a specific task, which has to be performed effectively and hygienically. It is essential to distinguish between hand operated lines and mechanical lines. In low throughput abattoirs (C-grade and lower) most of the functions are carried out by hand where as the high throughput abattoirs (A & B-grade), these functions are mechanised.

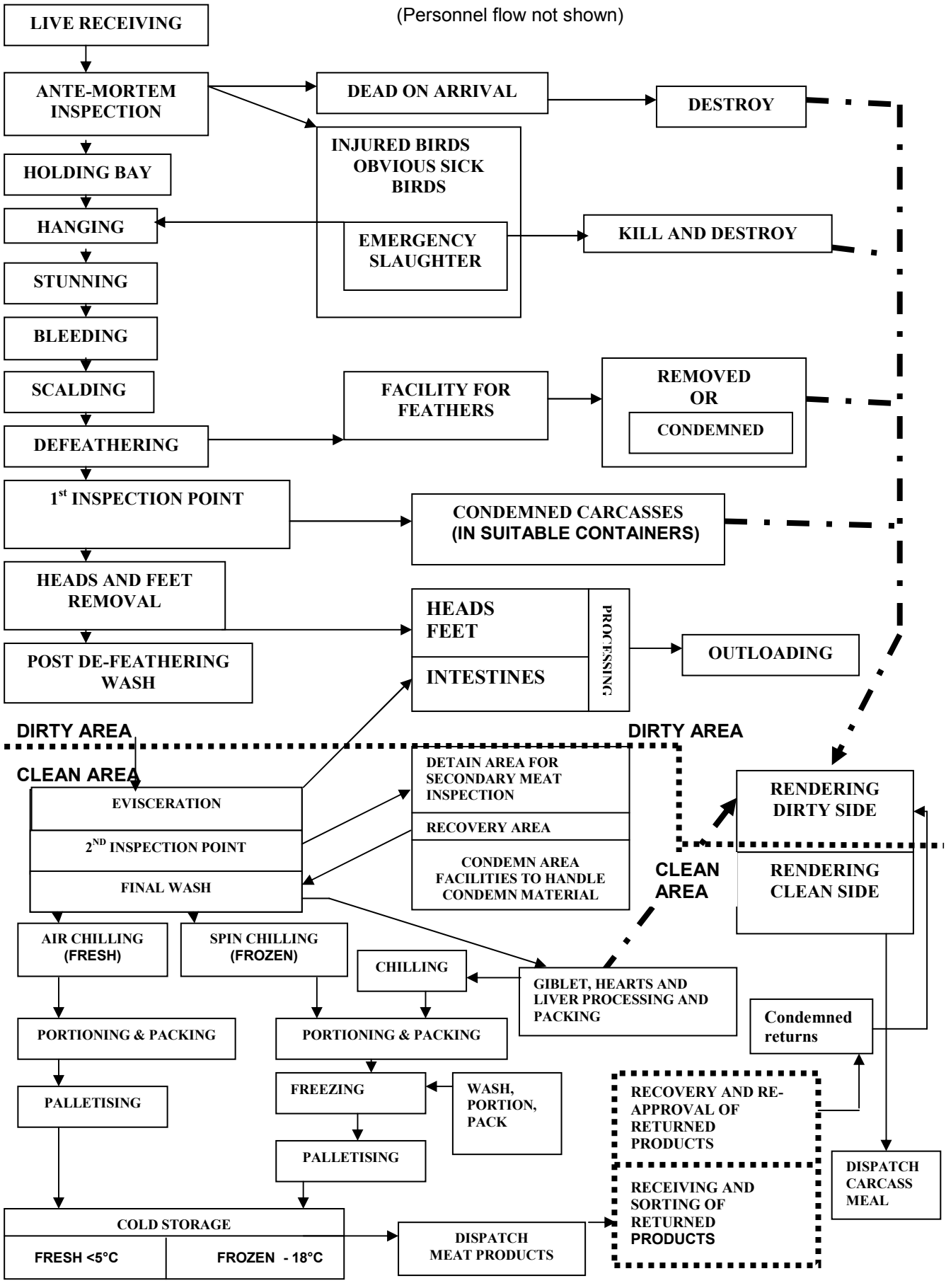
2. EQUIPMENT

The following table will give a short explanatory description of the different equipment required

EQUIPMENT: ACTION	MECHANICAL LINE	HAND OPERATED LINE	FUNCTION
OFF LOADING	EASY LOAD SYSTEM	BY HAND	TO OFF LOAD THE LIVE BIRDS FROM THE TRUCKS
STUNNING	IN-LINE ELECTRICAL WATER BATH	DRY METHOD HELD BY HAND	TO RENDER THE BIRD UNCONSCIOUS
BLEEDING	AFTER NECK CUTTING – INLINE BLEEDING TUNNEL	AFTER NECK SLITTING PLACED IN BLEEDING CONES	BLEEDING OUT/ exsanguination
SCALDING	IN-LINE SCALDING TANK	HAND HELD IN SMALL WARM WATER BATH	TO SOFTEN THE SKIN AND FEATHERS TO FACILITATE DE-FEATHERING
DE-FEATHERING	IN-LINE DEFEATHERING MACHINES	HANDHELD OR 5-10 BIRDS AT A TIME DEFEATHERING APPARATUS	TO REMOVE THE FEATHERS
HEADS AND FEET REMOVAL	IN –LINE HEAD PULLING AND HOCK CUTTING	NECK CUT OFF WITH KNIFE OR SCISSORS	TO REMOVE THE HEADS AND FEET
VENT CUTTING	IN-LINE VENT CUTTER	PNEUMATIC VENT DRILL, KNIFE OR SCISSORS	TO CUT LOOSE THE CLOACA
ABDOMINAL SLITTING	IN-LINE OPENING CUTTER	KNIFE OR SCISSORS	TO OPEN THE ABDOMINAL CAVITY
EVISCERATION	IN –LINE EVISCERATING MACHINE	EVISCERATING SPOONS MANUAL	TO LIFT THE ORGANS OUT OF THE CARCASS
CROPPING	IN LINE CROPPING MACHINE	MANUAL REMOVAL OF CROP USUALLY PRIOR TO EVISCERATION	TO REMOVE THE CROP AND OESOPHAGUS
CARCASS AND ORGAN SEPARATION	EITHER DONE BY HAND OR MECHANICALLY	SEPARATED BY HAND	TO SEPARATE THE CARCASS AND THE ORGANS
OFFAL SEPARATION	AUTOMATICALLY SEPARATE RED OFFAL FROM DIRTY OFFAL	OFFAL SEPARATION DONE BY HAND	TO SEPARATE THE RED OFFAL FROM THE DIRTY OFFAL
GIBLET HARVESTING	AUTOMATICALLY SEPARATE THE INTESTINES FROM THE GIZZARD AND CLEAN THE GIZZARD	SEPARATION OF GIZZARDS AND INTESTINES DONE BY HAND MANUAL CLEANING OF GIZZARD	TO SEPARATE THE GIZZARD AND INTESTINES PLUS CLEANING OF GIZZARD
NECK PULLING	IN-LINE NECK PULLER	NECK CUT OFF WITH KNIFE OR SCISSORS	REMOVE NECK FROM CARCASS
PREPARATION FOR FINAL INSPECTION	IN-LINE VACUUM MACHINE	HAND HELD VACUUM TUBE	SUCKS OUT ALL THE DEBRIS THAT STAYED BEHIND E.G. LUNGS SEXUAL ORGANS ETC.
FINAL WASHING	INSIDE OUTSIDE WASHER	WASH DONE BY HAND OR SHOWER TYPE SPRAYER	TO GIVE THE CARCASS A FINAL WASH
EQUIPMENT: ACTION	MECHANICAL LINE	HAND OPERATED LINE	FUNCTION
CHILLING	SPIN CHILLER/AIR CHILLER	COMMERCIAL TYPE FREEZERS	TO COOL THE CARCASS DOWN AS RAPIDLY AS POSSIBLE
PORTIONING	IN-LINE CUTTING MACHINE ,KFC ETC.	CUTTING DONE BY HAND	TO DIVIDE THE CARCASS INTO DIFFERENT PARTS
PACKING	AUTOMATIC WEIGHING AND SORTING SYSTEMS , ALSO DONE BY HAND	SORTING AND PACKING IS DONE BY HAND	PACKING OF PORTIONS/WHOLE BIRDS FOR RETAIL PURPOSES
IQF	GYRO FREEZER	BLAST FREEZER (SELDOM DONE)	INDIVIDUALLY QUICK FROZEN PORTIONS

3. FLOW DIAGRAM FOR A POULTRY ABATTOIR

(Personnel flow not shown)



4. "DIRTY" AREA OPERATIONS (PRE-EVISCERATION PROCESSES)

4.1. Catching, Loading, Transport And Receiving

When transferring poultry ready for slaughter from the chicken houses to the abattoir, there are certain important factors that influence the quality of the product, the mortality rate and the production cost of such an operation.

Extensive research has proved that a better quality meat with a longer shelf life can be produced if poultry are handled with greater patience, understanding and humaneness. The poultry meat industry loses millions of rands annually as a result of bruising and injuries caused by loading, unloading, rough handling and transport of poultry.

4.1.1 Catching and Loading Of Live Poultry on the Farm

The most important factors are:

- Catching must be done in accordance with the codes of practice of animal welfare.
- Planning the catching and loading procedure well in advance allowing adequate time for birds to be handled quietly and humanely in a way that does not cause them injury and stress.
- Birds must receive food during the 24 hours prior to travel.
- Birds must receive water prior to loading.
- Feed must be withdrawn 9 to 12 hours prior to slaughter. Faecal contents of the intestinal tract becomes less compact and more watery if feed is withdrawn more than 12 hours prior to slaughter causing contamination during evisceration.
- The withdrawal of coccidiostats according to the manufacturer's instructions is very important.
- Before collecting poultry, any hindrances from fixtures and fittings, especially sharp edges and protrusions, must be removed from the cages or transport containers.
- Catchers on the farms must be well trained in the correct method of catching and the humane handling of the birds.
- Catching of birds must be done as quickly as possible to prevent struggling, which can cause bruises and fractures.
- Catching and loading with dimmed lighting will help to avoid excitement, which in turn will limit injuries.
- Good supervision is very important.

4.1.2 Transport

The Driver of a vehicle transporting live birds has the following responsibilities:

1. He must be a responsible person.

2. He must at all times perform his duties in an expert and responsible manner.

3. He must take training courses offered at various centers and the owners of transporting vehicles must encourage him to do so.

4. He must be in possession of a valid and appropriate driver's license for the vehicle to be driven by him and carry it together with emergency telephone numbers and contact numbers of the poultry owners with him at all times during a journey.

5. He must transport poultry in roadworthy vehicles.

6. He must be trained to do the necessary adjustments to the truck when required.

7. Transport vehicles must be constructed to protect poultry against adverse weather conditions.

8. In the case of a breakdown of a truck without a standby facility and a subsequent increase of temperature in the load space, he must offload the load if the system permits or space the crates to accommodate the circumstances where possible.

9. He must ensure that poultry transporting vehicles are always, if possible, parked in the shade and only for very limited periods in the sun if there is no alternative.

10. He must provide for sufficient shelter and ventilation for birds in transit.

11. He must only stop en route when necessary. When stops are made in hot weather, the vehicle must be parked in the shade where possible and, if in the sun, for very limited periods only.

12. He may not handle the vehicle in a manner, which will cause the poultry to suffer injury. He may never ignore or disregard the safety and welfare of the birds.

13. He may not transport birds with their feet tied.

14. The journey should not exceed 24 hours.

4.1.3 Crating of birds

1. The poultry must be loaded into clean transporting crates or purpose-made wire mesh cages in trolleys.

2. Different species of poultry should not be loaded into the same crates at the same time.

3. Thorough cleansing of crates and trailers after each delivery at the abattoir must be done to avoid:

    - spreading of disease between farms
    - contamination of water in the scalding tanks with feacal contents
    - contamination of public road ways.

4. The height of the containers must allow poultry to move their heads freely when sitting on the floor.

5. Use well-ventilated crates for the transport of birds;

6. The containers or crates must be of a correct design that the heads, wings or feet cannot protrude through the holes.

7. All the containers should have lids that can be secured to prevent the chickens from escaping.

8. Crates must not be overloaded.

9. The floor space requirements are as follows:

Category	**Minimum Floor Space**
Day – old chicks	21 –25 cm2 per chick
Poultry of less than 1,6 kg	105 cm2 per kg
Poultry of 1-3 kg	110 cm2 per kg
Poultry of 3 – 5 kg	150 cm2 per kg
Poultry of more than 5 kg	175 cm2 per kg

Transport Container Space Requirements

10. The number of birds per container depends on available floor space, the body size of the birds and prevailing environmental conditions at the time of transport. All birds should be able to rest on the floor at the same time and remain evenly distributed.

11. Place fewer birds in crates during hot days;

12. Containers with birds should not be handled roughly.

13. Containers of live birds should be moved in a horizontal position only. If a conveyor is used for loading crates of live birds, the conveyor angle should prevent the tilting of containers causing birds to pile up. Containers should not be thrown or dropped. They should be moved smoothly during loading, transport and unloading.

14. A tie – down device preventing containers from overturning is advisable.

4.1.4 Receiving

1. Vehicles waiting to off-load live poultry and crates with live poultry after offloading must be parked or put in a shaded area while maintaining ventilation through crates.
2. Crates with live poultry must be handled in such a manner as to avoid unnecessary suffering, injury, pain and excitement of birds.
3. Birds in crates must be slaughtered within 8 hours of arrival at the abattoir and must not be kept overnight.
4. Trucks and crates for the conveyance of live birds to the abattoir must be washed after delivery and before leaving the premises.
5. An ante mortem inspection must be carried out if possible:

    - Consignments must be monitored for birds that are dead on arrival, moribund, injured or unfit for slaughter.
    - Reasons for Dead on Arrivals, sick or injured birds must be determined and the information transmitted to farm managers or veterinarians through management.
    - Moribund (dying) birds must be euthanased and condemned, whilst injured birds fit for slaughter must be slaughtered as soon as possible.

4.1.5 Ante-Mortem Poultry Inspection (At The Abattoir)

Poultry must be subjected to an ante-mortem inspection if at all practically possible to ensure:

a. a high standard of hygiene in the receiving area (receiving bay):
b. that poultry is handled with care from arrival at the abattoir until stunning takes place:
c. that stunning and bleeding are done effectively and thoroughly.

- Consignments must be monitored for birds that are dead on arrival, moribund, injured or unfit for slaughter.

- Reasons for Dead On Arrivals, sick or injured birds must be determined and the information transmitted to farm managers or veterinarians through management.

- Moribund (dying) birds must be euthanased and condemned, whilst injured birds fit for slaughter must be slaughtered as soon as possible.

The supervisor in the live poultry receiving/ stunning and bleeding area is in control of operations. Inspection is carried out on the slaughter line.

The workers hanging live poultry on the shackle line assist with this task which includes the following functions:

- The placing of dead poultry/ DOA's/ dead on arrivals in suitable containers with tight fitting lids which are marked with the letter "DOA", to be destroyed later.
- Ensuring that the birds are handled humanely during off-loading and hanging
- Ensuring that proper stunning and adequate bleeding takes place.
- Ensuring that general hygiene standards are maintained.

Research has shown that:

- 90% of all injuries sustained by poultry occurs within 12 hours prior to slaughter
- 35% injuries takes place in the poultry houses
- 40% of injuries are due to handling by the catching crew
- 25% of injuries takes place when birds are placed into or removed from crates, as well as during the hanging process.

4.1.6 The Handling Of DOA' S (Dead On Arrival)

- DOA birds may not be presented for slaughter.
- DOA' s must be put in a special container/bin marked for that purpose with tight fitting lids and which are marked accordingly.
- Optional Post-Mortems may be carried out to establish the cause of death for follow up actions.
- The DOA's must be handled as condemned material as discussed in Part 1 Module 4.
- Records must be kept.

4.2 Hanging and Stunning

4.2.1 Hanging

- DOA's may not be hanged.
- The live poultry receiving-and stunning areas must have dimmed lighting.
- One minute must be allowed between the hanging and stunning point.
- Approximately 15 to 18 birds per minute per handler are permitted.
- Hangers hanging the birds must treat them in a humane and calm way.
- Birds must be hanged facing the same direction.
- Both legs must be secured into the shackles.
- Provide a guide rail, which will relax the birds.
- Limit bends in the slaughtering line to a minimum.
- Remove any disturbing obstructions.
- Supervision is important.

4.2.2 Stunning

- An alternating current of 60/ 110 mA are required for small and large chickens respectively, the current should only go through the head and specifications for the equipment must be followed.
- Line speed must allow for 4 to 7 seconds contact time (dwell time) within the stunning apparatus.
- 11 to 15 seconds is allowed from stunning to throat slitting.
- A saline solution can be used to increase the conductivity of the water and make stunning more effective (0.1% saline solution).
- Total recovery time after stunning should not exceed 2 minutes.
- Constant maintenance must be done on the equipment.
- Except in the case of Jewish ritual slaughter for which special provisions are made for (Government notice R537 of 7 April 1977) all birds must be stunned before being bled.
- The ideal voltage for electrical stunning is debatable, but as a guideline, voltages between 50 V and 70 V should be adequate for wet stunning if the head and neck of a bird is immersed in the electrified bath.

4.2.3 Stunning By Hand and Mechanical Stunning

Mechanical

- The most common method of stunning is to make use of an electrified water bath deep enough to cover the head and neck.
- The voltage used for the stunning of poultry depends on the type of stunning apparatus as well as the type and size of the bird.
- Stable and direct contact between birds and the shackles, which serve as a conductor, are necessary for effective stunning. In order to obtain this, wet the legs of the poultry with a spray.

Hand

Stunning of poultry in the smaller abattoirs is usually done by hand. This method is also called the dry method. The stunning apparatus has two electrodes against which the bird's head is pressed for ± 4 seconds. The electrode must made contact with the bird's head right between the ears and eyes.

4.2.4 Reasons For The Stunning Of Poultry

Apart from it being essential from a humane point of view it also has the following advantages:

- causes unconsciousness
- essential for effective bleeding
- facilitates de-feathering
- calms poultry for optimal neck slitting/ cutting (The birds hang almost motionless)
- stabilise the blood pressure, heart beat and respiration
- minimises flightiness
- minimises red wing tips (coagulation of blood in wings)

4.2.5 Characteristics Of Proper Stunning

- neck is curved
- eyes are wide open
- both legs are stretched rigidly
- wings are held very tightly against body
- birds are totally relaxed after 9 to 11 seconds

4.2.6 Effects Of Poor Stunning

Too low current stunning

- excessive wing flapping in and after stunner
- bird is still awake and reacts on it's environment
- insufficient bleeding
- broken wings
- haemorrhaging on the thighs, legs, wings and breast areas.

Too high current stunning

- wings fall abruptly open directly after stunning
- neck is abruptly stretched and no tension on the neck remains
- insufficient bleeding
- bulging blood vessels and red wing tips
- over stunning or kill stunning makes feathers harder to pull thus causing poorly de-feathered poultry
- broken wishbone and breast bone

4.3 Neck Slitting And Bleeding

4.3.1 Neck Slit By Hand And Mechanically

- Throat slitting (severing the neck arteries) can be done mechanically or by hand.
- Should be done 10 to 15 seconds after stunning
- The lapsed time of 10 – 15 seconds provides for a totally relaxed bird and therefor better bleeding.

- **By hand**: The slaughterer /operator severs either the right or left carotid artery at the base of the scull. The trachea and spinal cord must not be cut. One slaughterer should be able to slaughter approximately 4 000 birds per hour effectively. By not cutting the trachea and spinal cord, the birds will continue breathing, the heart will keep on pumping and therefore bleed out more effectively.

- **Mechanically**: The birds go through a cutting apparatus with a guide that turns the head in the right position and a rotating blade on the other side that severs the jugular vein. The basics of the process is the same as is done by hand with the provision that close attention must be paid not to crush the bones of the neck vertebrae and skull.

4.3.2 Bleeding

- The bird should bleed for at least 90 seconds.
- Respiration must stop and the bird must be dead before entering the scalding tank. This will prevent water in the scalding tanks from entering the lungs and air sacs and contaminating the carcass.
- More than 80% of the blood is lost within 40 seconds of slaughter.
- Thorough bleeding results in a lifeless, non-struggling carcass before immersion and soaking takes place.
- A sharp knife or blade must be used for this purpose and must be sterilised frequently.

4.3.3 Effects Of Poor Throat Cutting Techniques And Insufficient Bleeding

- Poorly bled carcasses are more red in colour than well bled carcasses and are characterised by a deep dark red neck skin and surrounding areas
- Lungs are contaminated with scalding water
- Heads get lost in plucker machines when incision is made too deep.
- Lacerations on wings and red wingtips occurs
- Live poultry drown in scalding tank – these birds have a uniformly darker red appearance

4.4 Scalding

4.4.1 The Process Of Scalding

- Soaking in hot water softens the skin and feathers thus facilitating the de-feathering process.
- Standard “hard” or “hot” scalding is done at ± 54 °C – 60 °C for 2 - 2.5 minutes. The epidermis is removed providing for a whiter looking carcass.
- Standard “soft” or “cold” scalding is done at ± 50 °C – 53 °C for 3.0 - 3.5 minutes. The epidermis is not removed providing for a more yellowish looking carcass.
- Birds soaked too long will have a cooked appearance.
- A soaking temperature, which is too high, will damage the epidermis of the skin and give the bird an overheated and uneven patchy coloured appearance. This will result in the loss of moisture and a shiny skin with a brownish background.
- The scalding process wets the feathers and warms the skin thus releasing some of the muscle pressure of the skin holding the feathers.
- The whole poultry carcass must be immersed.

- A constant inflow of clean water at the right temperature is necessary to keep all carcasses totally submerged at all times and to control the build-up of micro-organisms.
- When the level is too low the “sock” feathers will not be scalded resulting in incomplete de-feathering of the hocks.
- Agitation of the scalding water is important in order to cause thorough penetration onto the skin and also prevent “cold spots” in the scalding tank.
- The soaking time and temperature depends on the desired result. (hot or cold scalding)
- A chlorinated water spray, after hot water immersion and just before de-feathering, is recommended in order to decrease micro-organisms.

4.4.2 Scalding In Smaller Abattoirs

Scalding can be done in a drum like scalding tank that can accommodate 1 - 10 birds at a time with a capacity of at least 20 liters of hot water. The scalding temperature can be higher than that used in the mechanised systems but the contact time will be much less e.g. 60 °C – 65 °C for 1 minute.

4.5 De-Feathering

4.5.1 The Process Of Defeathering

- De-feathering takes place after soaking.
- De-feathering machines consist of round metal discs with grooved (corrugated) rubber fingers which spin (rotates) on either side as well as below the hanging bird.
- The softness/ hardness of the rubber fingers and the regular replacement of damaged fingers are important for proper de-feathering.
- The rubber plucker fingers are colour coded for the different grades of stiffness/ hardness.
- By placing the plucking machines in series, excessive loss of carcass temperature is prevented.
- Water used in the de-feathering machines should not exceed 20°C to prevent any further damage to the epidermis.
- The required amount of water in the puckers should be between 0,25 – 0,50 litres per bird. The nossles of the sprayers should be directed as such that they easily wash away all the feathers on the plucker discs and inside walls of the plucker machine.
- In the smaller grade abattoirs there are various different models of de-feathering apparatuses that are used, they can differ in size from 1 – 10 birds at a time. Birds are hand-held in a drum type machine.
- Maintenance and performance checks on de-feathering machines are very important
- A trained supervisor for this department is important. This person must understand the importance of setting the height angle and distance between the plucker banks.
- The condition of the plucker fingers is equally important.

*4.5.2 **Practical performance checks:** (HMS function)*

- Check whether all fingers are still in the discs.
- Check whether all the discs are clean, too many feathers on the discs indicate too low water usage.
- Check tension of belt (should not slip).
- Regular checks of the wear on fingers should be carried out.

4.6 The First Inspection Point

The first inspection point is situated directly after de-feathering. Here the meat examiner will perform meat inspection on the de-feathered but unopened bird.
(See Part III, Module 1)

4.7 Removal Of Heads And Feet

4.7.1 Head puller

- An automatic head and oesophagus puller removes the head together with the oesophagus. By pulling the head off, the oesophagus and trachea is pulled out of the neck. During this action the crop is loosened and this will facilitates the removal of the viscera. The positioning of the head puller and feet cutter should be so that meat inspection can take place before the heads are removed.
- The correct setting of the machine ensures an undamaged neck skin as well as a reduction of contamination by the crop contents.

4.7.2 Hock cutter

- When adjusting the hock cutter it is important to cut the feet through the hock joint. The hock joint must be exposed for meat inspection purposes.
- If the leg bone is cut off too short, (below the joint) birds will fall out of the shackles.
- When the hock is cut off with too much extra bone the height of the cutter should be lowered.
- After the feet have been cut, they must be removed from the shackle line.

Heads and feet are cut off by hand in the lower grade abattoirs.

It is important to do meat inspection on heads and feet because heads and feet are classified as edible offal for human consumption in the RSA.

4.8 Post De-Feathering/ Pre Evisceration Wash

A carcass washer, maintained by adding potable water containing bactericidal levels of a chemical approved for the use on foodstuffs, must be available to wash carcasses before evisceration. If chlorine is used, the concentration must be 5 p.p.m.

5. CLEAN AREA OPERATIONS

5.1 Evisceration

5.1.1 Transfer

Carcasses are removed from the de-feathering line and passed through a hatch connecting the dirty area with the clean area. The carcasses are then re-hung on the evisceration line.

Carcass evisceration comprises the separation and removal of the internal organs, neck and crop from the carcass.

The line speed maintained during the evisceration process is in relation to:

- The method of the evisceration process, i.e. by hand or mechanical
- Availability of workers
- The competency level of the workers
- Health status of the poultry.

The evisceration process comprises of several tasks, which have to be performed in sequence, namely –

5.1.2 Vent Cutting

- A circular incision is made around the cloaca freeing it from the skin and pelvic tissues
- This process is also called “vent cutting”:

On a mechanical line this is done by an in – line vent cutter. The adjustment and maintenance of this machine is very important. Poorly adjusted and blunt vent cutters will result in bile and feacal contamination. In smaller abattoirs this is done with a knife, scissors or with a pneumatic hand held vent drill.

5.1.3 Opening Of The Abdominal Cavity

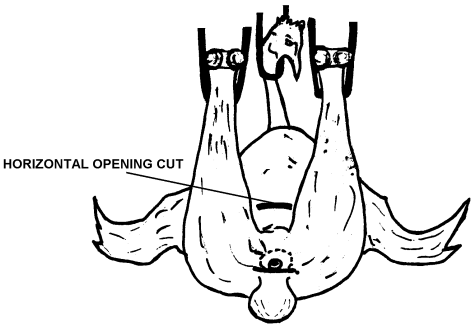
An incision from the cloaca to the end section of the breast bone is made in the abdominal wall, to expose the intestines.

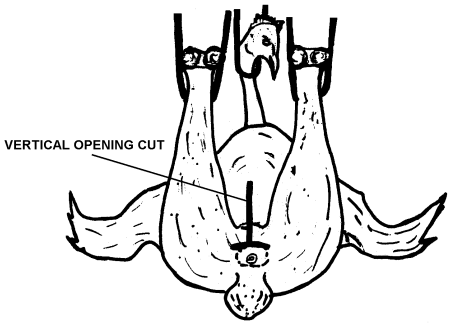
On a mechanical line an in-line abdominal slitting machine does this.
Maintenance is very important because blunt blades can result in machine damage and contamination.

In smaller abattoirs the slitting of the abdominal wall is either done with a knife or scissors. Scissors used must have a blunt point to prevent puncturing of the intestines or gall bladder. The incisions can be made horizontally or vertically.

Caution must be exercised to prevent:

- Faecal contamination if cutting into the gut
- Bile contamination if puncturing the gall bladder
- Excessive water pick-up if cutting the opening too large
- Tearing of intestines if the opening is to small





5.1.4 Lifting Out Of The Intestines (Pack)

Mechanical Line

An in-line-eviscerating spoon lifts the intestines out. Different makes of mechanical machines are available. Maintenance, adjustment and setting of these machines are vital because the evisceration process is the main source of faecal and bile contamination.

Hand Operated Line

On the hand operated evisceration line the organ pack is lifted out with an evisceration spoon by hand. Caution must be exercised not to damage organs like the liver, to tear the intestines and thus cause bile or faecal contamination. The lungs must be removed. To avoid bile and faecal contamination, the workers must be properly trained.

The intestines now hang outside the carcass to expose the heart, liver, lungs, gizzard and gut, which makes it possible to carry out thorough meat inspection.

5.2 The Second Inspection Point

The second inspection point is situated directly after evisceration. The carcass and organs are still corresponding with one another. Depending on the type of equipment the organs may still be attached to the carcass or hang on a separate line. The examiner examines the carcass and organs and detains suspect carcasses for the recovery area.
(See PART III Module 1)

5.3 Carcass And Organ Separation

The carcass and intestines are finally separated from each other, either mechanically or by hand and the intestines are pumped or manually removed to their various packing points. This is also a place where major contamination can take place if this operation is not done with the utmost care.

5.4 Cropping

On mechanical lines this is done after evisceration. Cropping is a type of drilling apparatus that removes the crop and pieces of the trachea. In smaller abattoirs the cropping is done by hand before evisceration is done.

5.5 Neck Cracking And Pulling

Neck cracking is done by an in line neck cracker to facilitate the removal of the neck. In the smaller abattoirs the neck is cut off with scissors after the crop has been removed but prior to evisceration.

5.6 Finishing

A vacuum or final inspection machine vacuums out remaining bits of abdominal contents (also known as debris) that were left behind in the birds and then the inside and outside of the carcasses are washed in a final wash.

5.7 Final meat inspection

A final inspection should be done especially on mechanical lines to ensure that cropping and finishing was done properly.
Problems encountered are commonly conditions like:-

- Bad cropping with retained rectums
- Contamination of the carcass with rectal contents
- Contamination of crop material
- Ineffective vacuuming resulting in retention of lungs.

5.8. Final Carcass Wash

On mechanical lines the carcasses goes through an inside/ outside washer with cold water containing bactericidal levels of a chemical approved for the use on foodstuffs that washes the carcasses simultaneously under mild pressure on the inside and outside. On manual lines the carcass is usually washed with a shower type sprayer.

5.9. Spin Chilling And Air Chilling

Different methods of chilling for the different grades of abattoirs are used. In the lower grade abattoirs chest freezers are often used. In the high throughput abattoirs (A- and B- grade) chilling methods like spin chilling and air chilling are used.

5.9.1 Spin chilling

A pre-chiller can precede the spin chiller. The temperature of the water in the pre-chiller or washer should be 18 °C and the dwell time in the chiller must not exceed 10 - 15 min depending on the size of the tank.

In the spin chiller there is a continuous cold water inflow through an aerated water bath at not more than 4 °C. The replacement rate of water at the carcass exit point is 1 litre of water for every bird entering the system. Water used in the spin chiller must have a chorine concentration of not less than 50 p.p.m. The product moves in-contra flow to the water. The-carcass core temperature entering the chiller is about 38 °C. The deep bone temperature of carcasses leaving the spin chiller must be less than 7 °C. The overall dwell time should not exceed 30 minutes.

The spin chiller must be drained and cleaned at the end of each shift, but where 2 shifts are worked per day, cleaning can take place at the end of the second shift.

The outside temperature of the carcass is also very important because this is the place where bacterial growth starts. When carcass temperature rises after spin chilling it causes weeping which results in moisture loss and a subsequent yield loss.

Carcasses chilled in this manner are used for frozen products. The water temperature, agitation and time is important for water pick-up. The maximum percentage of water pick-up allowed after spin chilling at the packing point is 8 % for all chicken carcasses.

5.9.2 Air chilling

A pre drying section can be used where the air temperature is ± 22 °C. The main purpose is to dry the carcass before it goes into the air chiller. A wet bird can sometimes show ice forming in the air chiller and that is unacceptable.

In the air chiller cold air at ± 0 °C is blown over the carcasses at 0.75 meters per second. This provides for a carcass that is dry and chilled. The deep bone temperature of these air-chilled carcasses should not exceed 7 °C.

These air chilled carcasses are used for fresh meat production.

5.10 Offal Handling

1. Red offal

(1) Consists of the neck, cleaned gizzard, liver, spleen and heart.

(2) Must be washed, packed and chilled without delay–

(a) to reach a temperature of 4°C or less within 12 hours of evisceration; but

(b) it need not be chilled at the abattoir if dispatched on a continuous basis to the chilling facilities, the proximity of which must not compromise hygiene standards and be approved by the provincial executive.

(3) When small spin chillers are used for the washing of red offal, the level must be maintained by adding water which may contain a bactericidal substance, which complies with the requirements of the Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act No. 54 of 1972) and is approved per protocol by the provincial executive officer, at levels not harmful or injurious to health, at a temperature not more than 4 °C at a rate of 1 litre per kilogram.

(4) Bile contamination must be avoided when removing gall bladders from livers.

(5) No red offal may be stored with or come into contact with rough offal.

(6) Where red offal is packed in cartons, containers or plastic bags for dispatch, chilling or freezing –

(a) it may only be done in a separate area or room and equipment must be provided for this function;

(b) storage facilities for clean empty bags or containers, for a day's use, must be provided; and

(c) bulk storage facilities must be provided for packing material.

(7) If any red offal is to be included in a chilled carcass, it must be wrapped and chilled to not more than minus 2 ^{o}C before inserting into the carcass.

(8) Gizzards must be opened, emptied, the mucosal lining removed and washed under running water without contaminating the surrounding area and products.

(9) Cartonned offal may not be stored in the same chiller as carcasses or un-cartonned offal.

2. Rough offal

(1) Rough offal consists of the head, feet and intestines.

(2) After evisceration and meat inspection, the intestines must be removed from the evisceration area.

(3) Intestines intended for human consumption must be washed, packed and chilled without delay, to minus 2 ^{o}C within 12 hours of evisceration but it need not be chilled at the abattoir if dispatched on a continuous basis to the chilling facilities, the proximity of which must not compromise hygiene standards and be approved by the provincial executive;

(4) Heads and feet must be washed.

(5) Wrapped, packed and chilled rough offal must be stored at minus 12 ^{o}C if not dispatched within 72 hours.

(6) Rough offal must be dispatched in leak proof containers.

(7) No rough offal may be stored or come into contact with red offal.

5.11. Cutting procedures at cutting plants.

5.11.1. General

(1) Only carcasses or meat that was inspected and passed may be presented for cutting.

(2) If carcasses or meat is received from a source other than the abattoir on the premises, the registered inspector must verify that –

(a) documentation pertaining to the origin of such meat is available;

(b) meat inspection was done on such meat and that it was passed; and

(c) the cold chain was maintained and that the core temperature is 4°C or less.

(3) All meat presented for cutting must be free of contamination.

(4) No meat that exhibits signs of spoilage may be cut.

(5) A registered inspector may at any time require any packed meat to be re-opened for inspection, and may authorize the resealing of any such opened container or carton.

(6) A linear production flow must be followed by avoiding cross flow, backtracking and accumulation or congestion of meat at any stage of the production process.

5.11.2. Cutting

(1) All the cutting, dicing or mincing must be so arranged that the hygiene of all the operations is assured.

(2) Bones derived from cutting procedures must be removed continuously to a suitable room or container provided specifically for this purpose.

(3) Meat that has been cut must be chilled, or freezing started, within one hour of cutting;

(4) Meat obtained from cutting and found unfit for human and animal consumption must be collected in properly marked containers or facilities and removed from the premises in accordance with Part VIII.

(4) Meat may be cut after the dressing process and primary chilling if –

(a) meat is transferred directly from the slaughter room to the cutting room in a single operation, the dressing room and cutting room being in close proximity;

(b) cutting is carried out immediately after transfer; and

(c) a protocol approved by the provincial executive officer is adhered to.

5.11.3. Wrapping

(1) Wrapping materials may not be kept in a cutting room in quantities greater than the daily requirement, and must be so stored and handled as to maintain them in a clean condition up to the moment of use.

(2) Exposed meat may not come into contact with cartons, unless waxed cartons are used.

5.11.4. Temperature control

(1) The air temperature of a room where meat is cut and packed, must be maintained at or below 12°C.

(2) Cut poultry meat must be subjected to uninterrupted chilling to reduce the core temperature of the meat to 4 ^{o}C within 12 hours in the case of chilled meat and meat that is being frozen may not be dispatched before a core temperature of minus 12 ^{o}C has been reached.

5.11.5. Sanitation

(1) Sanitizing and sterilizing of hand and other equipment must be done on a continuous basis during working hours.

(2) The cleaning and sterilization procedure of portable and other equipment must comply with Part II C (5).

5.11.6. Further processing

Further processing must comply with the requirements set in the Requirements for Food Premises under the Health Act,1977 (Act No. 63 of 1977).

6. Chilling and freezing at abattoirs

6.1. Requirements

(1) All chilling, freezing and cold storage facilities for meat must comply with the Structural Requirements for all abattoirs contained in Part II B(1).

(2) Chillers and freezers must be equipped with dial thermometers or where required by the provincial executive officer, continuous thermo-recorders, to give an accurate indication of the air temperature within the room.

6.2. Temperature capability

(1) A chiller used for final chilling of poultry meat must be capable of providing uninterrupted cooling to reduce the core temperature of the meat to $4^{o}C$ within 12 hours.

(2) Meat, carcasses and portions being frozen may not be removed from the freezer before a core temperature of minus $12^{o}C$ has been reached.

(3) (a) The defrost mechanisms for freezers and chillers must prevent the build-up of ice on the chilling coil surfaces to levels detrimental for temperature maintenance;

(b) Where a chiller or freezer contains meat during a defrosting cycle, defrosting of each chilling coil must be completed within 30 minutes; and

(c) Drainage connections of ample size must be provided from drip trays of air cooling units and must lead to ground level outside of the room or directly into the drainage system.

(4) A chiller or freezer must have a visible permanent notice fixed to the outside stating –

(a) the cubic capacity of the room;

(b) the type of product which may be chilled, frozen or stored in it;

(c) the maximum permissible product load in kilograms for that room;

(d) the final temperature required for the meat in degrees Celsius and the minimum period of time, in hours, which is necessary for this temperature to be achieved; and

(e) in the case of a storage chiller or freezer, the maximum permissible mean temperature value at which meat may be introduced.

6.3. Loading practises for chillers and freezers

(1) Meat must be packed so as to ensure adequate air circulation while being chilled.

(2) No meat may be stacked directly on the floor.

(3) Warm carcasses may not be loaded into a chiller containing chilled meat except in cases of in-line chilling or where the provincial executive officer may determine otherwise.

(4) (a) No carcass or meat which is unfit for human consumption or may have a detrimental effect on other meat may be stored in a chiller or freezer containing edible products; and

(b) A carcass or meat must be removed immediately if it deteriorates to such a state as determined by the registered inspector.

(5) No exposed meat may be stored in a freezer or chiller containing cartoned products.

(6) Rough offal may not be stored in a holding freezer which contains carcasses, meat or red offal, unless all these products, including the rough offal, are wrapped and packaged.

(7) No item or product other than meat may be stored in a chiller or freezer except in the case of holding freezers, where approval has been granted by the registered inspector.

6.4. Ice

(1) The use of ice as a coolant in an abattoir is subject to prior approval of the system by the provincial executive officer.

(2) Ice, incorporated in any system or equipment which is utilized for the chilling of meat, must be made from potable water.

(3) Equipment or systems incorporating ice as coolant for meat must be designed and operated in such a manner that water melting off the ice will not adversely affect the product or adjacent areas.

6.5. Sanitation and vermin control

(1) Equipment used in chillers, freezers or cold storage facilities, that may come into direct contact with the meat, must be kept in a clean and hygienic condition, and provision must be made for cleaning and sterilizing such utensils directly after use.

(2) Ice formation in freezers must be prevented and freezers must be defrosted and sanitized as frequently as may be required by the registered inspector.

(3) Chillers and freezers must be free from vermin, mould and bacterial growths.

(4) Chillers, freezers and cold storage facilities must be free from odours, which may be absorbed by meat.

(5) Chillers in regular use must be sanitized immediately after dispatching of all meat.

6.6. Records

(1) Thermo-control records must be available on request by the provincial executive officer or national executive officer.

(2) Checks must be done according to the requirements of the Hygiene Management System in practice.

7. Loading of carcasses and meat for transport

7.1. Loading and transport in general

(1) A vehicle used for the transport of meat must comply with the requirements set in the Requirements for Food Premises under the Health Act.

(2) Rough offal may not be loaded in the same loading space as carcasses, portions or red offal, unless such rough offal is kept in clean, waterproof containers with tight fitting lids complying to specifications for equipment as set in Part II B(1).

(3) No cartoned products may be loaded in the same loading space as exposed meat.

(4) No unwrapped meat may be loaded directly onto the floor.

(5) Where required by the provincial executive officer, the driver of a vehicle transporting meat must provide the name, address and contact details of the owner of the vehicle.

(6) Meat returned to an abattoir or cold storage facility may be received only after re-inspection by the registered inspector, and may only be sorted and salvaged for human consumption under conditions determined by the registered inspector.

(7) Loading of meat by informal traders must be regulated by a protocol approved by the provincial executive officer but without compromising hygiene or safety standards.

8. Sanitation

8.1. Water and equipment

(1) There must be available for sanitation purposes –
  (a) potable or drinking water;
  (b) hot water at not lower than 82°C in sterilizers for disinfecting hand equipment;
  (c) water at not lower than 40°C at hand wash basins for washing of hands; and
  (d) water at not lower than 40°C for general cleaning purposes.

(2) The abattoir owner must supply all the necessary equipment and material for the sanitation process.

8.2. Sanitation programmes

(1) Sanitation programmes must be approved by a registered inspector.

(2) A detailed post slaughter sanitation programme must be in place containing –
  (a) a list of all areas and rooms to be cleaned;
  (b) the frequency of cleaning;
  (c) step by step cleaning procedures for each area, room or equipment including ablution facilities, meat transport vehicles and off loading areas;
  (d) technical sheets of the chemicals used must be available with reference to accredited approval for use in meat plants, active ingredients, dilution rates and applications;
  (e) results, including microbiological monitoring, to be obtained as the objective of the sanitation programme; and
  (f) job descriptions and a training programme for all cleaners.

(3) Programmes must be in place for continuous cleaning during –
  (a) work periods;
  (b) breaks; and
  (c) shift changes.

(4) Sanitation must commence immediately after production for the day or shift has ended, but no sanitation may commence in any area before all edible meat and products have been removed, to prevent contamination.

(5) A new shift may not commence before all areas, rooms and equipment have been cleaned and disinfected and an effective pre-production monitoring programme must be in place to ensure cleanliness of all facilities before production commences.

8.3. Chillers and Freezers

(1) Chillers must be sanitized before a fresh load of meat is loaded.

(2) Chillers may not be sanitized if it contains meat.

(3) Freezers must be defrosted and thoroughly sanitized at least once a year or more often if required by a registered inspector.

9. Cutting

9.1 Definition and requirements

Portioning is the cutting up of a chicken into pre-determined recognisable pieces (wings, thighs, drumsticks etc.).

- Portions must be roughly equal in size.
- The skin cover of the portions must be complete.
- Cutting can be done mechanically or by hand.
- The amount of portion cuts per carcass depends on market demand. There is a five- seven- or nine-cut method.

- Before any portion is packed, it must be inspected and cleaned by the QA team. All pieces of lungs, bronchial tubes, windpipes, blood clots, and other debris must be removed.

- The types of portions according to Regulation R946 of March 1992 are as follows:

1. Half carcass
2. Quarter carcass alternatives: Front quarter, hindquarter, thigh plus drumstick.

9.2. Special wrapping & packing techniques in poultry

9.2.1 Different wrapping techniques:

The most common methods of wrapping include:

Whole birds:

- Separate as A-grade whole birds, as fresh or frozen with or without giblets.
- Bulk unwrapped in foilene lined cartons.

Portions:

- Fresh or frozen portions in polystyrene trays or portions in different weight bags or
- Bulk in foilene lined cartons.
- Foilene covering of cartons must be complete, products must not be able to come into contact with the cartons

The most common wrapping techniques include:

- Hermetically sealed plastic bags for products with sauces
- Vacuum packing (cry-o-vac)
- Sealed plastic bag with portions
- Polystyrene buckets with transparent plastic cling wrap
- Plastic buckets with lids for livers
- Carton boxes with wax lining the inside – meat may only come in contact with the wax part
- Thin plastic covering meat in carton boxes
- Plastic crates to transport whole carcasses from the one plant to the other
- Woven plastic bag

The most common packing techniques include:

- Carton boxes for the wrapped product
- Plastic crates for wrapped meat

9.2.2 Criteria for wrapping and packing material

- Wrapping material must be transparent and colourless
- In the case of coloured transparent wrapping material it must leave the meat partially visible and it may not be used again to cover meat
- Where polyethylene is used to cover meat or line boxes, the following requirements must be met:

    1. It must be crystal clear and not thinner than 125 *gauge*
    2. The pieces of material must be large enough to cover the whole piece of meat or line the entire inside of the box.

- Packaging used to keep meat in must be new, clean and in good order (it may only be used once) and:

1. May not alter the organoleptic characteristics of the meat
2. May not be capable of transmitting substances harmful to the user to the meat
3. Must be strong enough to protect the meat during transport, storage and handling.

- Packing material may not be re-used for packing meat except if the packing material is made from corrosion resistant material which is easy to clean and sanitise and which was cleaned and sanitised before.
- Packing crates must be square and must be so designed as to not keep more than 39,09 kg net weight of firmly packed meat.
- The inside may not be more than 720 mm, by 480 mm, by 180 mm.
- The package must be clearly marked on both sides with the following information:

    1. Name and address of registered trademark of packer
    2. Identity number of abattoir
    3. Date of packing
    4. Net weight of contents
    5. Accurate description of contents

- The staple machine must be fenced off from the deboning room to prevent contamination of the product.

9.2.3 Storage facilities for wrapping and packing material

Wrapping must be:

- Held in a clean, dry store away from walls and floors in a special container.
- Kept secure and under the supervision of the hygiene manager
- Vermin free
- Monitored by means of a hygiene management system for the bacteriological testing of in contact packaging material and it MUST be available in the case of high throughput abattoirs.

Packaging material drawn from a “bulk store” to a “daily use store” and/or in-line facilities, must be subjected to the following conditions:

- Only one days supply may be kept in the deboning room.
- Must be protected against contamination until the moment of use.
- Must be assembled under hygiene conditions before brought into the processing area.
- May only be handled and distributed by a “non-meat handler” in higher throughput abattoirs.
- In low throughput abattoirs a meat handler will be permitted to handle and distribute in contact packaging material provided the necessary protective clothing is worn to avoid product contamination.

9.2.4. Wrapping and packing of fresh poultry meat

a) Parts of poultry or offal separated from the carcass must always be wrapped in a firmly sealed protective covering satisfying the criteria stated in 5.11.1.2.

(b) Where cut fresh meat or offal is wrapped, this operation must be carried out immediately after cutting and in accordance with hygiene requirements.

(c) Wrapped meat must be packaged.

(d) However, when wrapping fulfils all the protective conditions of packaging it need not be transparent and colourless and placing in a second container is not necessary provided that the other conditions are fulfilled.

(e) Cutting, boning, wrapping and packaging operations may take place in the same room if the packaging is re-usable as described or subject to the following conditions:

- the room must be sufficiently large and so arranged that the hygiene of the operations is assured;
- the packaging and wrapping must be enclosed in a sealed protective covering immediately after manufacture; this covering must be protected from damage during transport to the establishment and stored under hygienic conditions in a separate room in the establishment;
- the rooms for storing packaging material must be dust and vermin-free and have no air connection with rooms containing substances which might contaminate fresh meat.
- packaging may not be stored on the floor;
- packaging must be assembled under hygienic conditions before being brought into the room;
- packaging must be hygienically brought into the room and used without delay.
- it may not be handled by staff handling fresh meat;
- immediately after packaging the meat must be placed in the storage room provided.

(f) At low throughput abattoirs if products are packed in cartons, exposed meat and carcasses may not be handled in the same room simultaneously with cartons unless:

- Exposed meat and carcasses are separated from cartons and persons handling cartons by a distance of at least 2 metres;
- There is no positive airflow from the cartons in the direction of the exposed meat and carcasses; and
- A separate carton store is provided where cartons are made up.

10 . MARKS AND MARKING

10.1. Specifications for marks

(1) The following marks of approval for meat are required for high, low and rural throughput
poultry abattoirs:

(Rural)

(Low throughput)

(High throughput)

(2) The mark must contain the following information:

(a) The abattoir registration number; and

(b) The wording shown in sub-regulation (1) which must be in at least two official languages, one of which must be English.

(3) The marks must be printed on the wrapping and packing or on labels of each individual carcass or cut portions in sizes to suit particular circumstances to the approval of the provincial executive officer.

10.2. Wrapping, packing and labeling

(1) All labels used on carcasses and meat must –

(a) be printed on food grade paper or plastic printing material and treated in the same hygienic way as in contact wrapping material; and

(b) include the mark in regulation 85 (1) and information required in regulation 85(2) as well as any other information required by the provincial executive officer.

(2) A wrapping bearing the mark of approval may not be re-used after opening.

(3) The provincial executive officer may by protocol exempt marking of poultry carcasses, at an abattoir, in cases where consignments of carcasses are dispatched from an approved poultry abattoir to an approved cutting and processing plant, subject to the following conditions:

(a) The cutting and processing plant belongs to the same owner as the abattoir.

(b) The carcasses are not individually wrapped, are conveyed in bulk in containers and transported in vehicles complying with these regulations.

(c) The loading space of the vehicle or container is locked and sealed.

(d) The dispatch office as well as receiving cutting premises maintains a record of the amount, type and destination of consignments.

(e) Carcasses and cut portions are marked as required in regulation 85(3) before leaving the cutting plant.

(4) Bulk packing, containers or cartons must be clearly marked on both ends with the mark of approval clearly visible and of readable size and provide information required by the Agricultural Products Standards Act, 1990 (Act no. 119 of 1990), as well as –

(a) the name, address and registration number of the establishments in which the meat was packed;

(b) the net weight of the contents;

(c) an accurate description of the contents;

(d) the date packaged or a code which enables the packaging date to be determined; and

(e) directions regarding the temperature at which the product must be stored.

10.3. Security

(1) The stamp of approval or wrapping and packing material on which a stamp of approval is printed, must never be used at an abattoir where the abattoir number differs from the number on such stamp.

(2) The registered meat inspector must satisfy himself or herself regarding the security of wrapping and packing material or labels on which the stamp of approval is printed.

10.4. General

(1) No person may, in an abattoir, place a stamp of approval on, or remove such mark from, any carcass, part thereof, meat or a wrapping, packing or container, except under the supervision of a registered inspector.

(2) The registered inspector may at any time re-inspect a carcass or meat, in an abattoir, notwithstanding that it may already have been passed for consumption and, if upon re-inspection he or she is of the opinion that it is no longer fit for human or animal consumption, he or she must remove the stamp of approval, and such meat must be condemned

10.5. Marking Must Also Indicate The Following:

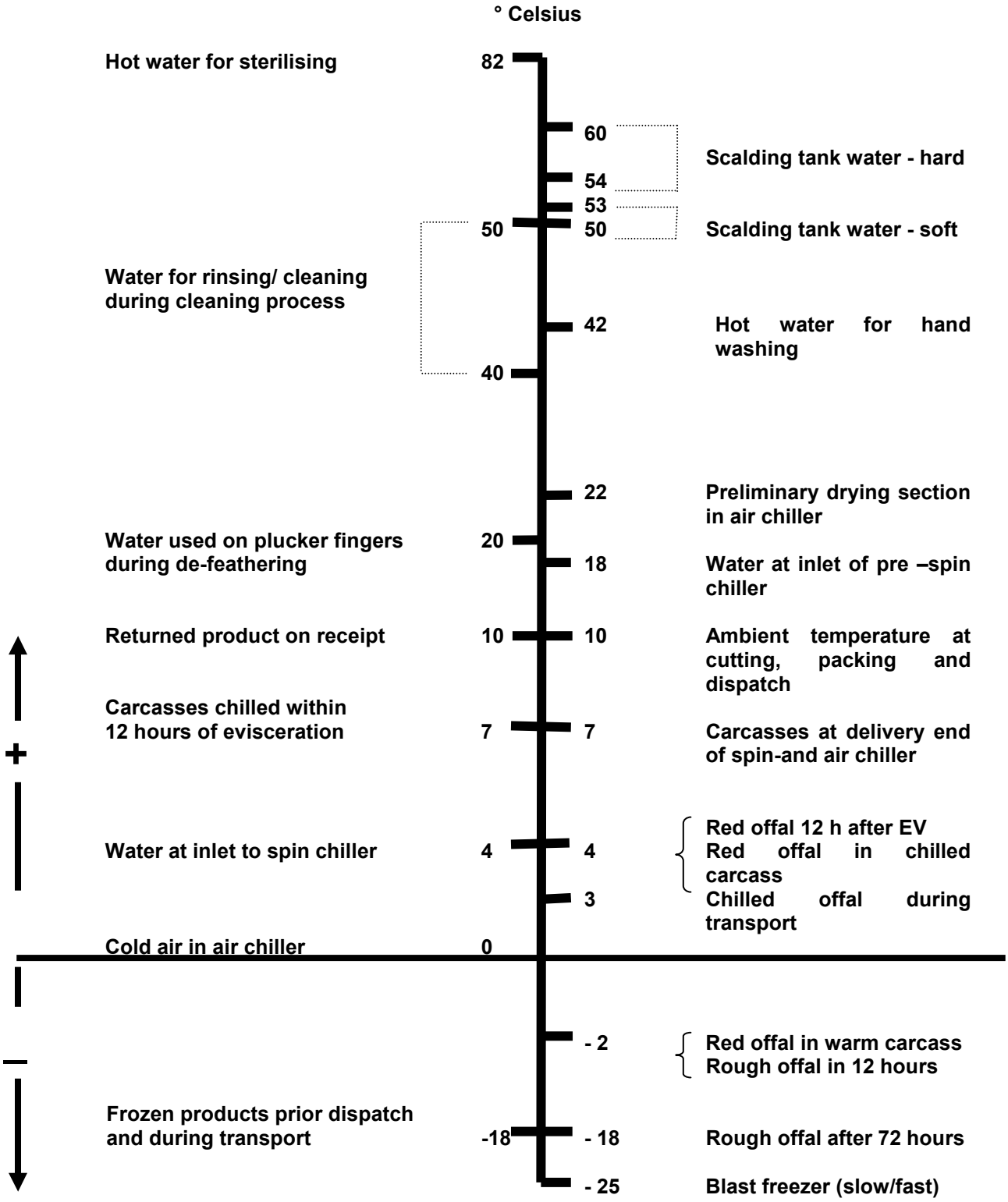
- Approval stamp
- Name of the abattoir
- Slaughter date
- Weight.
- Type of product
- Barcode for recall procedures indicating Lot no. and date of packing.
- "BEDIENINGSVOORSTEL" or "SERVING SUGGESTION"
- "KEEP FROZEN" OR "KEEP CHILLED"
- Information such as HALAAL or COSHER must be indicated
- Nutritional information
- Value adding (if cooked etc.)
- Use and amount of additives in products and whether it is Natural or Artificial
- Use by date (last date that the product can be used)
- Sell by date (last day that fresh product can be sold)
- Whether the product has been irradiated.
- The sodium (salt) and fat contents in the product
- The lable will also indicate the proposed daily intake of the ingrdients on a table according to percentage
- If the product is intended for petfood , it must be indicated
- Not only the carcasses but portions and offal or any other products of poultry intended for human consumption must be marked accordingly

10.6. Purpose Of Information On Marks

- To get important information in connection with:
  Name of product
  Product contents
  Quantity
  The producer and address
  How to use the product in order to make the best use of it ("KEEP FROZEN" Cook For 10 min.") .
- To prevent false or misleading information (All labels must be approved before use)
- To prevent old products from being sold to the public
- Identifying the standard of contents, what it contains and do not contain and prohibitions on the contents.
- To prevent unlawful practises.
- To give information to the consumer concerning use and amount of additives in products and whether it is natural or artificial
- Indicates if product was irradiated
- Indicate sodium (salt) and fat contents in the meat,
- Indicates nutritional value of the meat
- Indicates proposed daily intake of ingredients on a table according to percentage

- The barcode will indicate production lot and date of processing and packing in case of recall procedure.
- Enables inspectors to approve/ condemn returns
- Public knows what they are buying
- Knowledge of origen of meat in case of bad product (legal prosecution)
- Some people only eat HALAAL or KOSHER

11. Summary of important temperatures in the abattoir (not on scale)



MEAT INSPECTORS MANUAL
POULTRY

PART II
MEAT INSPECTION

MODULE 3
ANATOMY

Index

Anatomy

ANATOMY

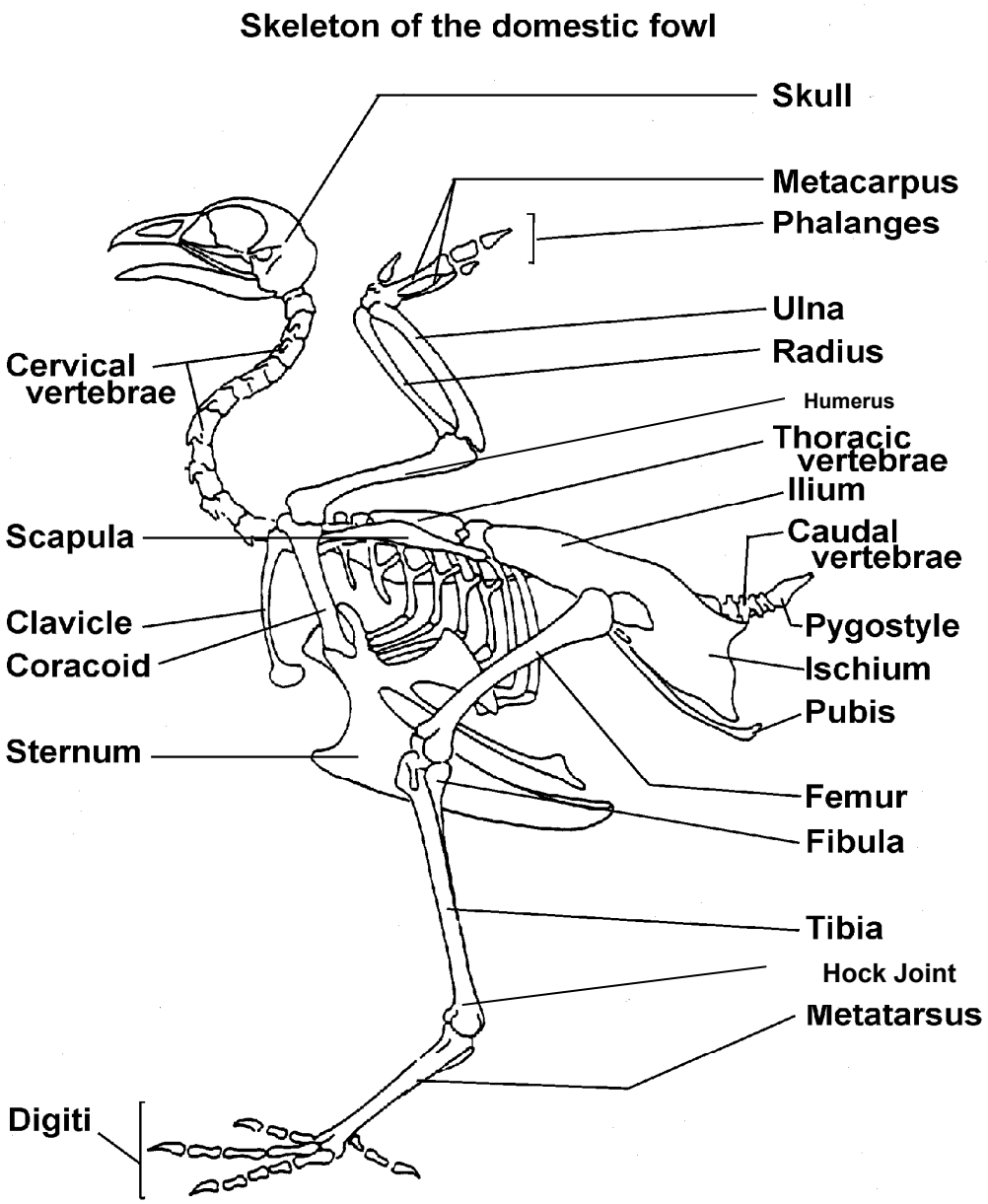
1. INTRODUCTION

Poultry are described as any chicken, duck, goose, turkey, guinea-fowl, partridge, pheasant, pigeon, quails and the chicks thereof.

2. SYSTEMS OF THE BODY

The chicken consists of a skeleton, muscles, organs and systems which are covered with skin and feathers for protection.

Each system consists of organs, muscles, tissue cells, etc., which function independently as well as collectively in order to exist as a healthy balanced organism.



2.1 Skeleton – (Frame Or Structure)

While most of the bones of the higher animals are present, their shape and in many instances their function is different.

The skeleton of the chicken consists of 150 bones and has two important functions:

- Serves as a framework for muscles and creates sturdiness, shape and provides protection for the systems and important organs.

- Accumulates Calcium and phosphates (in the form of organic salts) in the bones. 99% of all calcium and 80% of phosphates present in the chicken are found in the bones.

The sponge-like bone contents of the long bones of the wings are responsible for the creation of red and white blood cells.

The skeletal system is also important in the respect that disease conditions of the skeleton cause financial losses to the poultry industry.

2.1.1 Skull

The bones conform well to the peculiar shape of the head of fowl. Instead of the upper and lower jaws, these parts are shaped into a sharply pointed beak, void of teeth and the nostrils are very close to the junction of the beak with the skull. The upper part of the interior of the mouth is split (cleft) and therefore much of the nasal cavity is common with the mouth so as to make swallowing of food much more difficult. Thus, it is that the bird must raise its head to cause the food and water to flow or glide back to the oesophagus. The junction of the head to the neck is very flexible and less solidly constructed than in mammals which provides greater mobility and likewise it is more readily detached from the body.

2.1.2 Vertebrae

(i) Neck - The number varies from thirteen vertebrae in the chicken to seventeen or eighteen in the goose. The very large articular surfaces of the joints provide for great motility of this region.

(ii) Thoracic Region - This part of the spinal column is comparatively short (7-9 vertebrae) with the majority being fused or fixed.

(iii) The Lumber & Sacral Region - About 14 in number and all fused or solid.

(iv) Tail - Composed of five to six vertebrae. Although some are fused there is considerable movement of the tail as a whole appendage.

2.1.3 Ribs

There are seven pairs, of which four are attached to the sternum (keel bone). The ribs have a peculiar flat process pointing backward to form a bridge to the next for greater protection of the internal organs.

2.1.4 Sternum

It is along, broad bone which extends form the point of the breast to the pelvis region and forms a bony support for the abdominal viscera to compensate for the lack of substantial abdominal muscles. The posterior part is cartilaginous and progressively becomes bony in nature with advancing age. Some anatomists have compiled tables for each species of bird of the rate of ossification to a point where it may be used as a rather definite indication of age. There is connection through the shoulder bones to the anterior thoracic air sac.

2.1.5 Wing

Most of the major divisions of the arm or front leg of the mammal are present but shaped and adapted for flying. The largest bone, the coracoid (see chart) has an opening which connects with the anterior thoracic air sac - (see explanation of air sacs).

2.1.6 Pelvis

The three bones (ileum, ischium and pubis) form a very incomplete girdle as compared to the enclosure present in higher animals. The three bones are solidly fused together and firmly affixed to the vertebrae. They form a strong roof over the pelvis and for the attachment of the leg bones (femur) but completely open beneath. This allows considerable expansion of the posterior abdominal region for egg production passage etc.

2.1.7 Legs

The upper bones of the leg, femur or thigh, tibia and fibula or drumstick are quite similar to mammals. Most authorities believe that there is also some connection with the abdominal air sacs.

2.2 Muscles

Only the groups that have peculiarities will be mentioned. Consists mainly of 2 types of muscles namely:

White muscle tissue, which is found in the breast meat of the chicken.
Red muscle tissue – it functions more effectively than white tissue and is therefore adapted for continuous exertion.

2.2.1 Cutaneous Muscles - (Those associated with the skin)

There is much more close association of the underlying muscles with the skin for functional purposes such as, these associated with the wing and tail to assist with motion and support of the large feathers of these areas.

2.2.2 Pectoral Muscles - (Chest or breast muscles)

These muscles are highly developed to enable flight and the degree of development under natural conditions is proportionate to the amount and speed of flying done by the species of bird concerned.

2.2.3 Abdominal Muscles

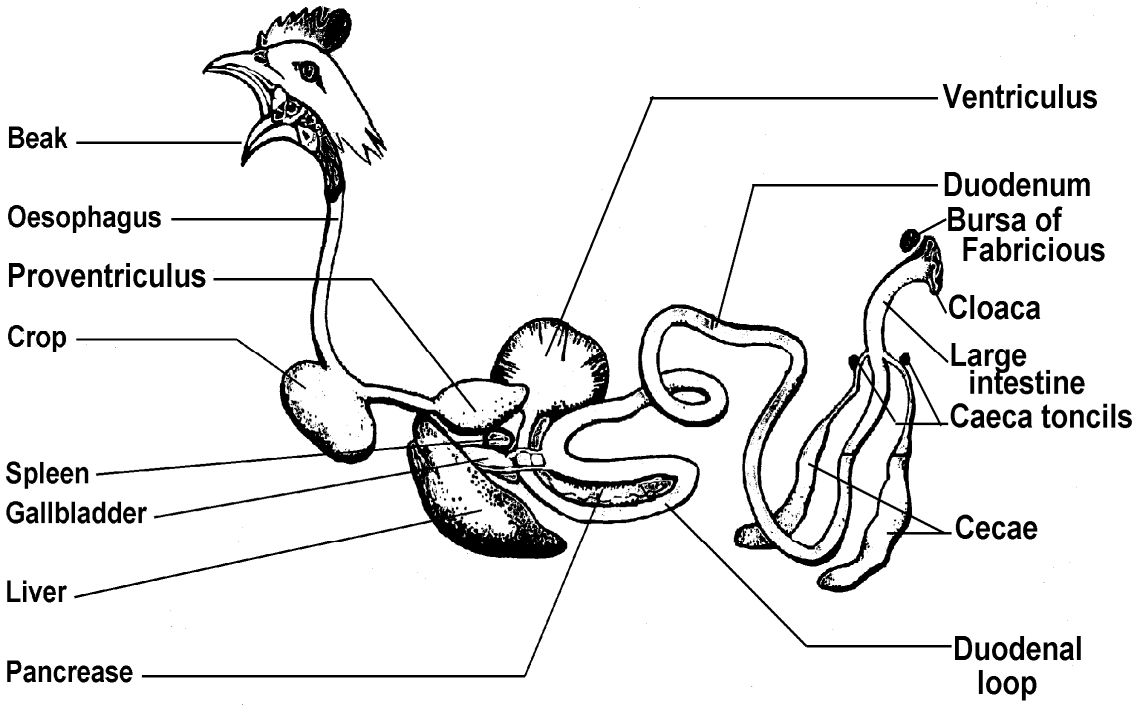
This group is much thinner and has less strength than mammals, in fact, they are only thin sheets of muscle and fibrous tissue.

2.2.4 Tendons of the Leg Muscles

Ossification or the formation of bone tissue in these tendons is common in many birds. We notice them particularly in turkeys.

2.2.5 The Diaphragm

In mammals this forms a complete muscolo-tendinous sheet separating the thorax from the abdomen. In birds this is only a thin membrane-like structure and there are two distinct parts. The first is something similar to that of the mammal - the second divides the thorax or chest into upper and lower compartments. These sheets are very light and posses large openings for the air sacs. The lack of a complete diaphragm and the air sac in addition to the lungs are some of the anatomical reasons why birds cannot cough or sneeze to expel mucous and debris of a respiratory disease, to the same extent as mammals.



Digestive tract of the domestic fowl

2.3. The Digestive System

The most important function of the digestive system is processing, absorption and assimilation of ingested food. The following body parts and their functions are encountered in this system.

2.3.1 Beak

The upper and lower segments are of bone covered with a heavy and very much hardened coating of epidermis (outer layer of the skin) replacing the lips. There are no teeth.

2.3.2 Mouth

Similar lining to mammals but the roof or hard palate is clefted (split). Delivery glands in the mouth cavity also moisten the food. There is no provision for mastication. The saliva is primarily lubricating in action. Swallowing is accomplished by raising the head as the palate is cleft and muscular contractions are absent.

2.3.3 Tongue

The covering is similar to mammals. The muscles are poorly developed but parts of two bones are present.

2.3.4 Salivary Glands

Production of saliva. There are five recognised groups of glands around the interior surface of the mouth and in the tongue. The saliva, unlike that of mammals is said to have little or no digestive properties and is mainly a lubricant for deglutition (act of swallowing).

2.3.5 Pharynx

This is the common passageway of the digestive and respiratory systems and has direct opening to the nasal passages via the cleft palate. In structure, it is quite similar to mammals.

2.3.6 Oesophagus

Is a muscular tube similar to mammals with an inner mucous membrane lining with circular and lengthways layers of muscles. This tube extends from the pharynx to the proventriculus.

2.3.7 Crop

This is only an enlargement of the oesophagus and serve as a reservoir for storage purposes and softens the food. There is an interesting deviation in the pigeon that at near the hatching time of the young the walls of the crop of the mother and the father become enlarged with fat, the cells of the lining slough off to form the "milk" for feeding the young.

2.3.8 Proventriculus - (Stomach)

The proventriculus is sometimes called the glandular stomach.
Although this organ is only slightly greater in circumference than the oesophagus, it has a very thick wall filled with glands which secrete a gastric juice namely pepsin(enzyme) and hydrochloric acid.

2.3.9 Ventriculus - (Gizzard)

A large muscular and tendinous organ designed to crush and grind the food. The gizzard is sometimes called the “muscular” stomach. The internal mucosa is very thick and is constantly being erated and sluffed off. The inlet from the oesophagus and the outlet to the duodenum is on the front-upper side of the organ.

2.3.10 Small Intestines

Although similar in structure to the mammal, they differ markedly in some parts. These are 5 - 6 times the length of the body. Most of the digestion and all the absorption takes place primarily in the small intestines

2.3.11 Duodenum

Forms a loop to support the pancreas and receives ducts from this gland and the liver.

2.3.12 Jejunum & Ileum

These are supported by the mesentery and bounded by air sacs, which separate them from the abdominal wall. There is often a slight pocket or sac, which is the remnant of the egg yolk. At the distal end or termination of the ileum there is a circular band of muscle covered with mucous membrane.

2.3.13 Large Intestines

Instead of the caecum, colon and rectum of the mammal we find a pair of ceca, rectum and cloaca.

2.3.14 Ceca - (Pleural-pair)

These are large blind pouches and may be as long as 15 centimetres. These are located at the terminal end of the ileum and lay back along and parallel to it, where they are connected to the ileum there are cecae tonsils on either side. These blind pouches are filled with soft material. The function of the cecae is not known.

2.3.15 Rectum

This is the portion of gut between the caecal openings and the cloaca. Some believe it could be called either rectum or colon.

2.3.16 Cloaca

The end gut and forms a passageway to the outside for the faeces, urine, eggs and sperm. Being common to all of these purposes it has considerable ability to expand and contract to meet the needs of the various functions. The structure is somewhat similar to the intestines. It is divided into three distinct sections.

2.3.17 Anus/ Vent

A circular orifice of muscle and elastic tissue.

2.3.18 Liver

Brownish in colour and is divided into two lobes. Very similar to mammalians and has a duct into the duodenum. Among its functions is the excretion of bile. The main function of the bile is to neutralise the acid in the small intestines and to emulsify the fat. Glycogen is also stored in the liver.

Gallbladder: The chicken has a gall bladder but some birds do not. Bile is stored temporary in the gall bladder

2.3.19 Pancreas

Similar to mammalians and has a duct into the duodenum. It secretes the enzyms amylase, lipase and trypsin, which help with digestion.

2.3.20. Digestion

To understand some of the conditions encountered in poultry it is necessary to understand the role of the various parts of the digestive system and its allied organs such as the liver and the pancreas. The alimentary tract of birds differs markedly from the higher animals in the following respects.

Mouth

There is no provision for mastication. The saliva is primarily lubricating in action. Swallowing is accomplished by raising the head as the palate is cleft and muscular contractions are absent.

Crop

Reservoir to hold and soften food.

Proventriculus

Although very small the glands of this stomach do secrete a gastric juice for protein digestion but the food is not there long enough for digestion to take place.

Ventriculus (Gizzard)

Purely mechanical action.

Intestinal Tract

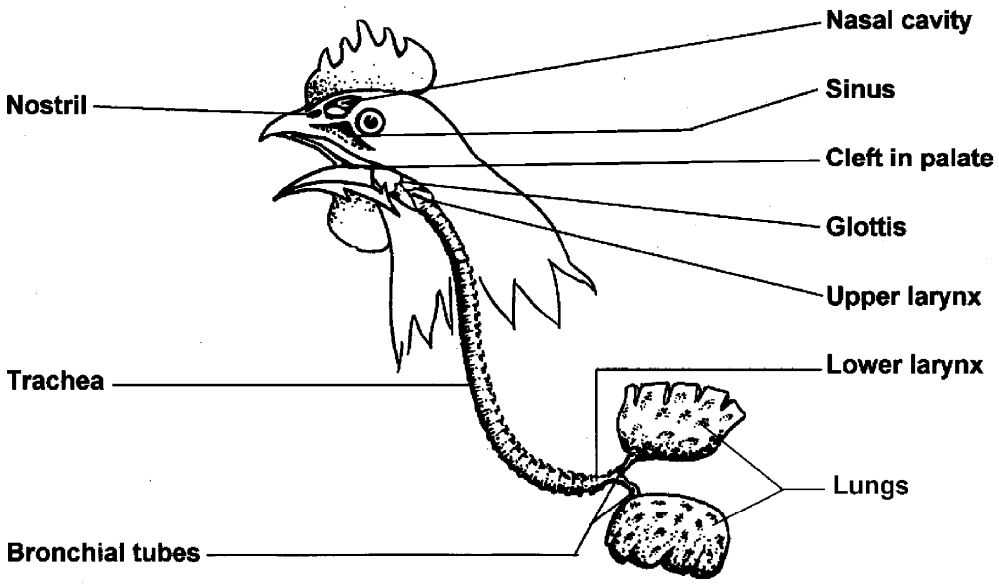
Principle seat of the lymph nodes and tissue.

Liver & Bile

Starch and fat digestion - stores glycogen.

Pancreas

Pancreatic juice works on proteins starches, sugars and fats and constitutes a principal digestive juice. In the intestines the most of digestion takes place, and all of the absorption is primarily in the small intestines.



Respiratory system of the fowl

2.4. The Respiratory System

The respiratory system consists of the mouth, nasal cavities and opening, larynx, trachea, syrinx, bronchi, lungs and air sacs.

While the microscopic structure of the upper respiratory track and the lungs is somewhat similar to

mammalians there are vast important differences which are of great significance to inspection.

2.4.1 Nostrils and Nasal Cavities

The exterior openings (anterior naris) are small and slit-like and may be surrounded with feathers. The turbinate or baffle bones of the mammals are absent but these are crosswise projections, which serve a similar purpose. The opening to the pharynx is large and directly through the cleft in the roof of the mouth.

2.4.2 Larynx

Is void of the protection of the epiglottis, cartilage and vocal cords.

2.4.3 Trachea

The cartilaginous rings are complete and divide into two bronchi, as does the trachea in mammals. The trachea consists of 120 cartilaginous rings and is situated on the right hand side of the neck.

2.4.4 Caudal Larynx – Syrinx

At the point where the trachea branches into the bronchi is a second larynx, the organ of voice of the fowl. Folds of elastic tissue at each side of the entrance to the bronchi form the vocal cords.

2.4.5 Bronchi

Prior to entry into the lung tissue the bronchi divide into three distinct segments, primary, secondary and tertiary. The first two pass directly on to the air sacs and the third serves the lungs.

2.4.6 Lungs

The lungs extend from the first ribs to the anterior part of the kidneys and are deeply imbedded between the ribs. They do not extend very much into the thorax cavity. The lungs are not formed into lobes as in the mammalians but are small groups of lung cells. They are at the ends of the myriads of small tubes with come off of the tertiary bronchi.

2.4.7 Air Sacs

These are thin membranous balloon-like sacs, which arise from first two segments of the bronchi, and many also have connection to the cavities of the principle bones.

Air sacs are composed of an outer layer of pleura or peritoneum and an inner layer of the mucous membrane, which is continuous from the bronchi. The number, size, extent, location and connection with bones is a point of considerable difference of opinion. However, for our purpose we have accepted the description given in Beister and Schwarte, which is:

The air sacs:

- Assists with the circulation of fresh air through the lungs because the lungs do not expand sufficiently.
- Makes it possible to stay air borne longer during flight without any additional muscular development.
- Creates proper gravitation during flight and helps bird keep its balance.
- It regulates the body temperature by diffusing water into the blood through the lungs in the form of moisture/perspiration.
- Provides a reservoir of air during flight.

i) Thoracic - Cervical - (paired) as the name indicates, they are located at the junction of the neck and thorax. Prolongations extend upward along the neck and adjacent vertebrae.

ii) Clavicular -(paired) as the name indicates, they are located along the clavicular bones.

iii) Anterior Thoracic - (paired) as the name indicates, these are located in the anterior (front) part of the thorax and communicate with the cavities of the bones of the shoulder girdle, humerus, sternal ribs and the sternum.

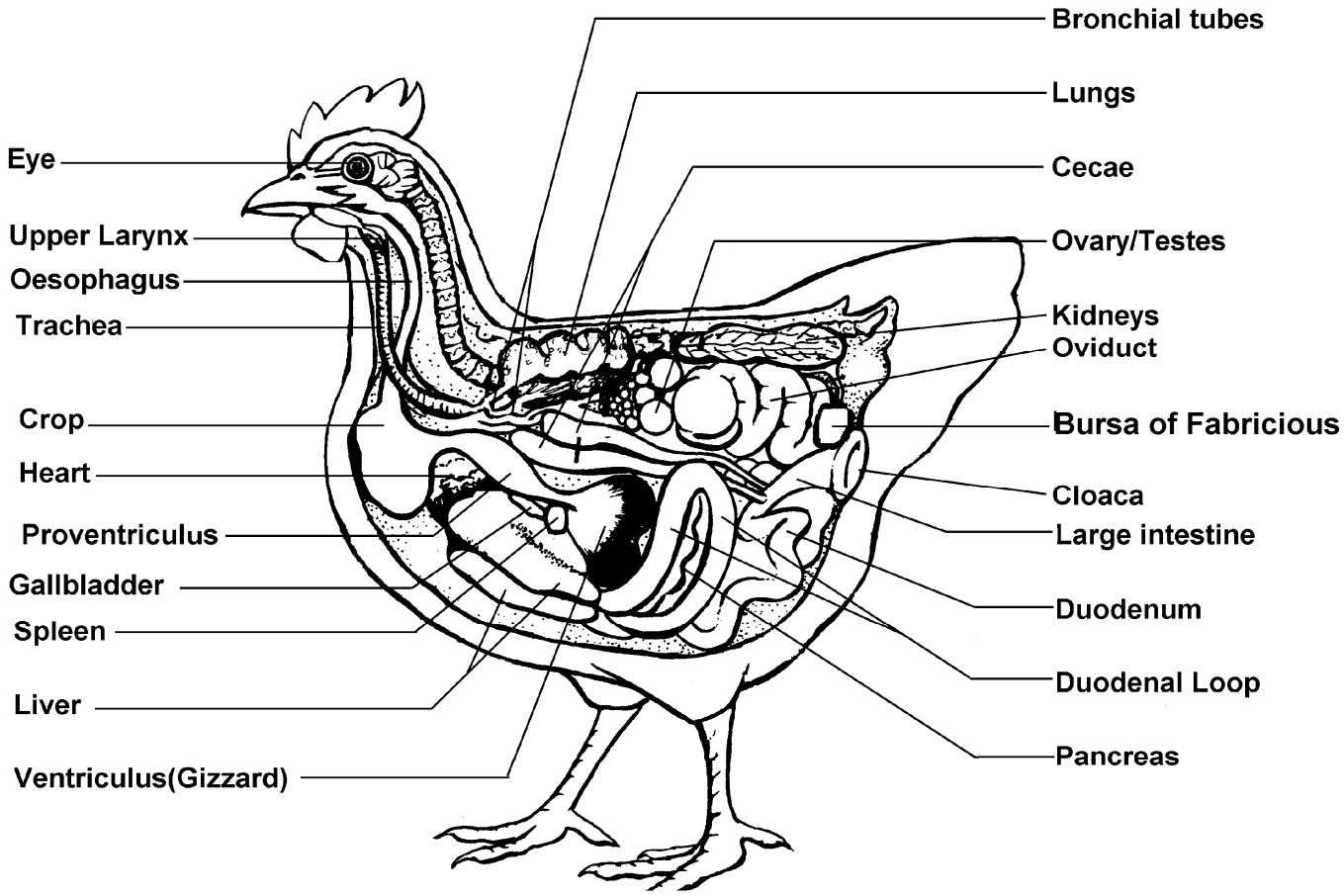
iv) Posterior Thoracic - (paired). Posterior part of the thorax but do not have connection with the bones.

v) Lesser Abdominal - (paired). Neither have connection with the bone.

vi) Great Abdominal - (paired).

The left is larger than the right. Most authors believe there is connection with the bones of the pelvic girdle and the femur. The respiratory system of birds is much more complicated than in mammals and it also is apparent that there is a much greater area for infection and complication during respiratory disease. The respiratory tract and/or system is therefore the site of many disease conditions and they are today among the most prevalent causes for condemnation.

Layout of the internal organs of domestic poultry



2.5. Peritoneum

The peritoneum is the thin film-like membrane, which lines the abdominal cavity, forms the outer layer of the air sacs and mesentery and enfolds the internal organs. It is given a different name for each location but basically it may be subdivided into parietal (lining the abdomen) and visceral (covering the viscera). Its purpose is to provide a smooth lubricated contact surface between the viscera and the abdominal wall to prevent friction.

In view of the large expanse of air sacs throughout the abdominal cavity, their fragileness and proneness to infection, there is a possibility of confusion of air sacculitis and peritonitis. All to frequent in the past the term peritonitis may have been used when in fact it was the former.

2.6. Urogenital Organs

2.6.1 Urinary organs

The kidneys are usually in three lobes and these organs are deeply embedded along the vertebrae and between the ribs. The urethras (tubes) can be traced from lobe to lobe and terminate in the urodaeum (the central section of the cloaca).

2.6.2 Reproductive organs

Male

Testicles are within the abdomen and are located under the anterior lobe of the kidneys. There are frequently dark or pigmented spots which could be taken as a diseased condition. In the chicken there is no penis - just the tube to the central portion of the cloaca - in the male goose there may be a rudimentary penis - like organ.

Female

Only the ovary and the oviduct persist on the left side. The oviduct (canal from ovarian mass to the cloaca) is a long twisted channel in which the egg develops. In some cases the tube may be 750mm in length.

2.7. The Blood Circulatory System

The blood circulatory system consists of the blood and lymphatic system. The heart is similar to that of mammals. In rapidly flying birds it may equal 25% of the body weight but in domestic fowl it is usual 4 to 8% as compared to 1,5% in man and large animals. The vessels are similar to mammalia and adapt to the peculiar needs of the fowl's body. The following parts and their functions are involved:

2.7.1 Heart

This is the pump of the body which pumps O_2 rich blood under pressure from the lungs to the organs and limbs and returns O_2 deficient blood or CO_2 back to the lungs again.

2.7.2 Blood

It consists of 75% liquid and 25% solids. The liquid, which is also known as plasma, transports digested nutrients to the cell where it also absorbs hormones, red blood cells and waste matter from the cells.

Cells
Are divided into two groups:

Red Blood Cells:

They transport CO_2 to the lungs and O_2 from the lungs to the blood cells (Erythrocytes).

White Blood Cells:

They are fewer in number but larger in size than the red blood cell and are the defence mechanism of the body against infection (Leucocytes and Thrombocytes).

2.7.3 Lymphatic system

The Lymphatic system contains the mechanism to manufacture white blood cells for body's protection or defence. Lymph cells are found throughout the body in different structures and tissues like the feather follicles in the skin, the thymus, spleen and liver. The germinal centres would appear to be in the bone marrow. Therefore, the system lymphatic glands of the higher animals are not present as "indicators o disease". Lymphoid patches are found in the mouth, tongue and along the digestive tract. The walls of the intestinal tract have a considerable amount of nodes and lymph tissue. Serves also as an intermediary system between the blood and the tissue. (That is the movement of nutrients from blood to the tissue and waste matter from the tissue to the blood).

2.7.4 Spleen

Is round in shape, red and more or less 20 mm in diameter and is positioned to he right of the proventriculus.

It is believed to serve a similar function to the mammalian spleen.

Removes iron from old/obsolete red blood cells. (Destruction of old cells are carried out by extracting iron out of these cells, and putting it back in the blood stream to be sent back to the bone marrow and liver for production of new red blood cells). In the case of mature chickens the spleen is responsible for the production of white blood cells which provide protection against infection. It also serves as a filter to remove toxins from the blood.

2.7.5 Thymus Gland*:*

Contains lymphoid tissue. It is the origin of the immune system and produces anti-bodies for immunity.

2.7.6 Bursa of Fabricius

Contains lymphoid tissue. Circulates and produces anti-bodies for immunity. It also produces certain white blood cells and plasma. When mature the bursa diminishes in size and its function is taken over by the spleen.

2.8. The Nervous System

Consists of two systems viz. Central and Automatic nervous system. The central nervous controls the voluntary movements and consists of the following components:

2.8.1 Brain

Enables certain nerves, which receive stimuli from processes e.g. the senses (sight, hearing, smell and taste), to react to it.

2.8.2 Spinal Cord

Is responsible for the transport of sensory and motor nerve impulses to and from the different parts of the body in order to:

- Facilitate muscular movement to bring about communication between the organs (instructions).

- The autonomic nervous system contains nerves from the intestines and these are not influenced by voluntary impulses from the brain.

- The heartbeat is controlled by this system.

- Other functions, which are controlled, are e.g. liver, pancreas, intestines, kidneys, colon, reproductive organs and blood cells.

- Control of fast and/or slow movements. (Reflex actions)

2.9. The Endocrine System

The following glands and their functions are involved:

2.9.1 The pituitary gland

Situated at the base of the brain. It secretes hormones, which are responsible for growth and, in the case of over-secretion, results in giant growth. Hormones also play a role in ovulation and the formation of the egg. Affects the growth of sexual organs of roosters and hens. They regulate blood pressure and the respiratory rate.

2.9.2 The thyroid

Situated at the base of the neck. Secretes hormones that will determine feather development and colour. Responsible for metabolism.

2.9.3 The Para-thyroid

Located under the thyroid. Important in the case of laying hens and regulates the calcium and phosphate metabolism. A malfunction of the parathyroid can cause abnormalities in the eggshell.

2.9.4 Adrenal Glands

Situated adjacent to the kidneys. Responsible for the production of adrenaline. Stimulates glands in the autonomic nervous system as well as the heart beat – over secretion causes high blood pressure.

2.9.5 Seed lobes: (Roosters)

Manufacture a hormone, oestrogen, which stimulates growth and functional activities of the ovaries and sexual characteristics. Egg yolk originates here.

2.9.6 The islands of Langerhans

Located in the pancreas and manufacturers insulin. Insulin is secreted when there are increases in blood sugar concentrations. Controls and regulates glucose metabolism. Manufacture and storage of glycogen. Oxidisation of glucose. Regulation of fat metabolism.

Located in the brain. Manufactures a hormone that is involved in growth and puberty.

2.10. Organs Of Special Sense

2.10.1 Eyes

Similar to mammalians except that the nictitans (membrane at inner canthus) regularly sweeps across the whole surface of the eye.

2.10.2 Ears

It is modified and not as complete as in the mammal.

2.10.3 Smell

Similar to mammalians.

2.10.4 Taste

Similar to mammalians.

2.10.5 Organs of Touch, Skin & Appendages

The sensory ability of feeling seems to be quite active.

2.11. Skin

Similar to mammals except

The body of the bird is covered by skin (cutis) which consists of two basic layers, a layer of epithelium (epidermis) and a layer of dense connective tissue (dermis). The skin of the chicken is thin as compared to most mammals.

The sweat and sebaceous glands are absent. There is a large oil gland - (uropygial gland), on the dorsal surface of the tail from which the birds lubricates the skin and feathers. The skin of the legs is scaled and horny. There is considerable connection with the muscles, which strengthen the feather follicles, which also contain a major part of the lymphoid tissues. The comb is a modified skin with a fatty, connective and erectile tissue as are the wattles.

Feathers

Have similar tissue and organ as hair. There is a large central shaft or quill with lateral grooves from which the barbs arise. Feathers are also modification of the epidermis. There are three types of feathers. Contour feathers are large and form a smooth protective surface over the body of the bird. Those on the wings and tail are used in flight. Downy feathers (plumules) are smaller and form a warm undercoat. Filoplumes are thin hair like rudimentary feathers. The contour feathers and the downy plumules are removed from the carcass in plucking operations. The fine filoplumes are removed by the singeing operation. The feathers arise from feather follicles, which are arranged in definite rows across the body (feather tracts). The feathers are moved by the contraction of small bundles of smooth muscle fibres situated in the dermis of the skin.

MEAT INSPECTORS MANUAL
POULTRY

PART II
MEAT INSPECTION

MODULE 4
PATHOLOGY

Index

PATHOLOGY

PATHOLOGY

1.INTRODUCTION

The purpose of this section is to give the meat inspector a basic understanding of the different pathological conditions found in poultry. It is not the intention to discuss all the diseases and conditions but some of the more important ones.

It must be emphasized that most of the diseases will not be directly recognisable during inspection but will need comprehensive laboratory analysis to be confirmed. It is important that the inspector knows the lesions that indicate the presence of diseases. These include nasal discharge, swollen head, congested (dark) carcass, emaciation, airsacullitis, pericarditis, perihepatitis, peritonitis etc.

Many of the diseases mentioned below will result in secondary *E. coli* infection and might all be very similar when the birds reach the processing plant.

Meat inspection will not only make poultry meat safer but will also remove aesthetically unacceptable conditions. To improve the safety of poultry products it is important to have an integrated health system involving production, processing, trade and finally an informed consumer.

2.DEFINITIONS

(1)	***Acute death***	*:*	Death with few or no ante-mortem symptoms e.g. Heart failure
(2)	***Acute disease/ condition***	*:*	Condition of relative short duration; not chronic.
(3)	***Ante Mortem***	*:*	Before death (before slaughter).
(4)	***Bacteraemia***	:	The presence of bacteria in the bloodstream.
(5)	***Chronic disease***	*:*	Of long duration, not acute.
(6)	***Disease***	:	A pathological state in any organ or part of the bird caused by micro-organisms.
(7)	***Epidemic***	*:*	An infectious disease contracted simultaneously by a great number of people or animals.
(8)	***Immunity***	*:*	The ability of the body to resist infection by producing anti-bodies.
(9)	***Incubation***	*:*	The period that elapses from the contraction of infection until the first symptoms are shown.
(10)	***Infection***	*:*	The successful invasion and growth of disease producing agents (bacteria or viruses) in parts of the body.
(11)	***Infectious Disease***	:	Disease transmissible from one animal/ person to another.
(12)	***Lesion***	*:*	Visible pathological change in the organ or part of the carcass.

(13)	***Microscopic***	*:*	Visible only by means of a microscope.
(14)	***Morbidity***	*:*	The extent to which the disease occurs.
(15)	***Moribund***	*:*	Dying.
(16)	***Mortality***	*:*	The incidence of death.
(17)	***Oedema***	:	An excessive accumulation of fluids in the intercellular spaces and body cavities.
(18)	***Pericarditis***	:	Inflammation of pericardium (heartsac).
(19)	***Perihepatitis***	:	Inflammation of membrane around liver.
(20)	***Post Mortem***	*:*	After death (after slaughter).
(21)	***Prognosis***	*:*	A prediction or forecast in respect of the possible effects or consequences of a disease.
(22)	***Pyaemia***	:	The spread of pus forming (pyogenic) bacteria through the blood stream (unusual in chickens).
(23)	***Rigor Mortis***	:	When all the muscles in the carcass stiffen after death.
(24)	***Symptom***	*:*	A functional sign of disease.
(25)	***Systemic Disease***	*:*	A disease that spreads through the blood and affects the body as a whole.
(26)	***Toxin***	*:*	A poisonous substance of biological origin.
(27)	***Trauma***	*:*	A wound or injury.
(28)	***Zoonoses***	:	A disease in the animal that is transmissible to man.

3. PATHOLOGICAL CONDITIONS

3.1 Anaemia

A defect in respect of the quality and/ or quantity of red blood cells.

- Pale skin, comb and wattles.
- Pale bone marrow, haemorrhaging in muscle tissue and possibly jaundice.
- Blood can appear watery as a result of a decrease in the number of red blood cells.
- Growth may be retarded

Causes:

- Nutritional deficiency
- Chicken anaemia agent (CAA) -unclassified small virus; causing infectious anaemia
- Protozoa (coccidiosis)
- Internal parasites (helminthiosis) and external parasites (lice)
- Loss of blood after an injury

Judgement:

- Total condemnation if it is due to an infectious disease or if the carcass is extremely anaemic.

3.2 Fatty Liver Syndrome

Occurs in laying hens. The liver appears pale and friable due to the accumulation of fat in the liver cells. Haemorrhages in the liver could occur. Liver may rapture, with the accumulation of blood in the intestinal cavity and death of the bird.

Cause:

Usually caused by excessive intake of high-energy diets.
Could also be artificially created by force-feeding.

Judgement:

Partial or total condemnation of the liver depending on the extent of the fat deposit.

3.3 Fever

“Fever is an increase of the body temperature, as a result of an infection by micro-organisms and an attempt by the body to ward off infection” It is one of the most important signs of Septicaemia.

During a post mortem inspection, certain changes in the carcass will give an indication that the live animal was suffering from a fever:

1. Abnormal redness of the carcass
2. Blood vessels generally are more filled with blood.
3. Poor bleeding out.

Causes:

a. Contagious diseases – viruses, bacteria, molds, protozoa or parasites.
b. Chemical and physical trauma.

Judgement:

Total condemnation.
(There might be an underlying illness and the blood filled carcass will have a short shelf life.)

3.4 Gangrene

The body tissues die off as a result of poor blood circulation. Bacteria invade the tissue. It mostly occurs in tissues susceptible to contamination e. g. skin, intestines, genital openings and penetrating wounds. Mostly the feet and wings are affected but the internal organs may also be affected. Affected parts are feverish, painful, dark and have a bad smell. Two forms occur, namely: dry and wet:

Dry gangrene: the blood circulation to a part of the body is cut off and the part withers or mummifies.

Wet/ Gas gangrene: There is still blood circulation and *Clostridium spp*. bacteria, which form gas, invade the lesion. Gas filled tissues may also contain bloody sera. Rotting of the necrotic tissue may lead to a bad smell and a purple, green-brown or black discolouration.

Causes:

Mainly poor blood circulation:

a. Freezing
b. Torsion (twisting) of organs
c. Infected wounds

***Judgement*:**

Total condemnation of carcass and organs.
Condemnation of the affected parts if the gangrene is very localised and there is no evidence of toxaemia.

3.5 Inflammation

Inflammation is the localised vascular and cellular protection reactions of living tissue to injury by destroying or isolating damaged tissues and their causes.

An inflammatory lesion is indicated by the suffix-“itis” e.g. Hepatitis or Peritonitis.

During the inflammatory process, the inner lining of the blood vessels (endothelium) becomes more permeable and permits the migration of white cells and plasma into the tissues.

The whole process can be categorised as:

a. Increase in the diameter of the blood vessels and the flow rate through them.
b. Increased permeability of capillary blood vessels.
c. Leakage of white blood cells.

Causes:

a.	Physical	-	injuries - including too much heat (burn wounds) or cold (freeze burn), irradiation, etc.
b.	Chemical	-	acid burn
c.	Microbiological	-	bacteria, viruses, protozoa, parasites etc.

The inflammatory changes seen have one or more of the following characteristics:

1. REDDENING
   Small blood vessels in the area distend and more blood flows to the area, giving the area a red appearance.

2. HEAT
   The area becomes warmer than the surrounding tissues due to the increase in blood flow to area.

3. SWELLING
   The extra-vascular plasma (fluids) and white blood cells as well as the distended blood vessels result in swelling of the affected tissues.

4. PAIN
   Caused by the sensation of swelling and pressure on the nerves as well as chemicals (histamine) that are released which evoke pain.

5. LACK OF FUNCTION
   Usually as a result of the pain.

Inflammation can be classified as acute or chronic:

- Acute: redness, swelling, heat, pain, loss of function.

- Chronic: As a result of connective tissue being deposited e.g., adhesions, cirrhosis of the liver, chronic arthritis.

Judgement:

Condemnation of the affected organs or tissues.
Total condemnation of carcass and organs if signs of septicaemia are present.

3.6 Necrosis

Death of specific cells or tissue which is still part of the living body. Normal tissue has a shiny, transparent appearance and dead tissue looks dull, looses it's colour and is sunken in.

Causes:

• Infection	-	pathogenic bacteria and viruses
• Disturbance of blood circulation	-	thrombus, pressure
• Toxic	-	organic, inorganic
• Trauma	-	injuries
• Thermo	-	too much heat/ cold
• Nerve damage	-	injuries, pressure, etc.

Judgement:

Condemnation of the affected part.
Total condemnation if signs of septicaemia is present.

3.7 Pericarditis

This is an inflammation of the heartsac. It can be thickened or covered with a cream coloured fibrous membrane. In severe cases the membrane might be attached to the heart and may affect the function of the heart.

Cause:

Infections: bacteria, viruses

Judgement:

Condemn the heart.
Total condemnation if signs of septicaemia are present.
(See *E. coli* page 177)

3.8 Petechiae

Small pin size haemorrhages in and on the surface of tissues and organs (skin, liver, muscles etc.).

Petechiae < 1 mm

Causes:

Usually seen as a result of septicaemia/ Gumbora.

Judgement:

Total or partial condemnation depending on the causes and the changes in the carcass.

3.9 Underfleshed/ poorness/ emaciation/ runt

Causes:

Genetic
Management
Disease

Judgement:

Total condemnation in extreme cases.

3.10 Purulence

The presence of pus.

Causes:

Injuries and the infiltration of bacteria.

Judgement:

Condemnation of affected and contaminated parts.

3.11 Septicaemia (Blood Poisoning)

A condition where pathogenic organisms are present in the bloodstream.

When bacteria penetrate the body, they usually do so through a wound or through the intestine or respiratory system.

A bird with septicaemia has fever and numerous small haemorrhages on serous membranes. The liver is usually pale and various organs may be infected.

Causes:

There are many kinds of micro-organisms that can cause septicaemia. In poultry meat inspection the most common cause of septicaemia is *E. coli* bacteria.

Judgement:

Total condemnation of the carcass and organs.

3.12 Bruising and Haemorrhaging

The time when bruising occurred can roughly be ascertained by the colour and intensity of discoloration:

- Yellow, green to purplish discolouration: during the growing stage and before the catchers arrive at the chicken houses (24 hours or longer before slaughter).
- Deep red or purple discoloration: during catching, loading and transport of poultry (4 to 6 hours before slaughter).
- Pink or bright red discoloration: during off-loading and hanging of poultry onto the slaughter line (2 to 15 min. before slaughter).

Causes:

Injuries during catching, loading, transportation, offloading and hanging.

Judgement:

Total condemnation where bruising and haemorrhaging covers more than 50 % of the carcass.
Partial condemnation (recovered as portions) if less than 50 % is affected.

3.13 Red Wingtips

Tips of wings are red.

Causes:

- Excessive flapping of the wings before death.
- Incorrect stunning (currents too high and in the range of 110 to 150 mA per bird – normal currents are between 60 - 110 mA)
- Poor bleeding (in birds which experience a cardiac arrest when stunned.)
- Harsh plucking.

These wing conditions develop when a bird with engorged wings passes through a plucker. The plucker ruptures the blood vessels in the wings and massages the blood out of the ruptured vessels into the surrounding wing tissue to form a haemorrhage.

Judgement:

Condemnation of the wing tips.

3.14 Insufficient Bleeding

Abnormal red colour: darker red areas on the lower hanging parts such as the wings and neck.

Causes:

- Ineffective throat cut procedure.

- Insufficient bleeding time (minimum 90 seconds) could be the cause of poultry still breathing when entering the scalding tank. The high water temperature coagulates the blood and bleeding stops. The bird drowns and this causes the red skin colour when eviscerated. Congestion of blood vessels and organs are caused as a result of the insufficient bleeding of the carcass.

Judgement:

Total carcass condemnation.

3.15 Over Scalding

- Skin is soft and pale and easily removed by means of friction.
- Intestines have a cooked appearance.
- 2 mm deep cut shows that the meat has a cooked appearance.

Causes:

- Excessively high temperature in scalding tanks.
- Too long exposure with warm water in scalding tanks.

Judgement:

Total condemnation if deeper than 2 mm is affected (Cut to be made at the second inspection point – no cutting allowed in the dirty area).
Partial condemnation if less than 2 mm deep is affected.

3.16 Fractures

Limbs show dis-figuration. Bones might stick through the skin.

Causes:

- Rough handling during catching, loading, transport or hanging process.
- Dark red haemorrhage indicate an older injury due to coagulation and breakdown of the red blood cells, this indicates the injury is a couple of hours/ day old indicating that the place of injury was the farm.
- Bright red blood haemorrhaging surrounding the fracture indicates a fresh injury that could have happened while hanging and is therefore an abattoir injury.
- Fractures without any haemorrhaging present means the fracture took place after bleeding and therefore is ascribed to machine damage and an abattoir fault. (machine damage)

Judgement:

- If the surrounding area shows haemorrhaging, affected areas must be condemned.
- Where advanced pathological changes (e.g. gangrene, plaque forming etc.) are observed, the whole carcass must be condemned.

- Fractures without haemorrhaging and contamination may be recovered for chunks.

3.17 Poor defeathering

Carcasses have many feathers still intact after defeathering.

Causes:

- Temperature too low in scalding tanks.
- Poor maintenance of plucker machines.
- Poor setting of the plucker machines.
- Line speed too fast in relation with temperature in scalding tank.

Judgement:

- Carcasses may be presented for repeat defeathering.
- Sections, which are poorly defeathered, can be condemned if a repeat de-feathering process is not possible.
- Repeat defeathering is allowed only if it can be done immediately after detection when the carcass is still warm.

NOTE:

Defeathering may only take place in the defeathering (dirty) area. No pin feathering is allowed beyond this point.

3.18 Contamination

Contamination should be prevented before it occurs. Light covers, separate store rooms for chemicals, machine maintenance, personal hygiene, health certification of poultry, good slaughtering techniques etc. are very important preventative measures and should be addressed in the Hygiene Management Systems.

Contamination can be divided into 3 groups:

- Physical — Pieces of glass, wood, small stones, material, nails, screws etc.
- Chemical — Sanitisers, insecticides, residues etc.
- Microbiological — Micro-organisms e.g. *E. coli* (from faeces), *Staphylococcus spp.* (from feathers and skin) and *Salmonella spp*. (from bile).

The following are possible sources of contamination:

- The birds being slaughtered (skin and feathers, intestinal contents, diseased birds with septicaemic conditions etc.)
- Workers (skin infections and other illnesses, poor personal hygiene and protective clothing, untrained, poor slaughtering techniques etc.)
- Equipment and work surfaces poorly sanitised and maintained (including incorrect storage of cleaning agents)
- Rodents and insects (droppings, urine etc.)
- Poor water quality (chlorine contents not adequate, microbiological tests not done etc.)

Causes:

There are many sources of contamination in the abattoir but for meat inspection at the 1st and 2nd inspection points the following are the most important forms of contamination:

- Crop content contamination e. g. No withdrawal of feed
- Faecal contamination e. g. Poor vent cutting

- Bile contamination e. g. Poor evisceration
- Pus contamination e. g. Septicaemic conditions
- Oil contamination e. g. Machine maintenance

Judgement:

1st Inspection point:

- No trimming may be done at the first inspection point (dirty area).
- Poultry falling off shackle lines onto the floor in the de-feathering area may be rinsed in running chlorinated water to a concentration of 50 parts per million available chlorine, or water with bactericidal levels of another approved chemical, and put back onto the line.
- In smaller abattoirs, carcasses may be rinsed in a drum for 30 seconds with 100 parts per million available chlorine concentration. The water in the drum must be replaced regularly to avoid contamination but running water is recommended.
- When birds fall onto or in the drainage channel under the plucker machines, they must be condemned because the water used for washing the feathers away is re-circulated water and therefore contaminated with dirt, feacal material etc.
- If the carcass merely dropped on the floor it may be placed in the spin chiller at the bird entering point.

2nd Inspection point:

- If any contamination is visible at the second inspection point, the carcass must be removed and trimmed at recovery.
- If more than 50 % of the carcass is affected, the carcass must be condemned.

3.19 Torn Skin Problem

Causes:

- Tears in the skin as a result of damage by the plucker machine, incorrect setting of the fingers.

- Tears in the skin as a result of scratches by claws of other poultry (back scratches) may become inflamed and infected. Scratches, skin tears and scabs are often the origin of infections e.g. dermatitis and cellulitis.

- Genetics of the poultry flock (slow and fast feathering of the body).

- Environment and management (warm and cold temperatures, poor ventilation, lack of space around feed and water troughs).

- Level of feed additives (amino-acids, energy- and salt levels).

- Disease conditions (an underlying disease condition e.g. Gumboro will be the cause of a decrease in the ability to recover from infections such as cellulitis or any other skin infection).

- The interchange between light and darkness (long days of summer, short days of winter).

Judgement:

Condemnation of the affected parts.

3.20 Bare Backs

- Naked, bloody backs and heads.

- Abscesses on the back with poor feather covering of the back.
- Coarse back skin and the presence of feather stubs.
- Could be confused with pocks in an advanced stage.

Causes:

- Abnormal behaviour pattern amongst poultry.
- The stocking rate in the house too high (over population).
- Malnutrition.

Judgement:

Condemnation of affected parts.

3.21 Breast Blisters

- The first stage of the infection shows up as a swollen area overlying the point of the breastbone (the soft breast section) that later hardens as the condition progresses.
- Breast burns with secondary infection.

Causes:

Contracted mainly during the growing period of poultry.

- Poor litter condition (wet litter)
- Weak bone structure (bird has difficulty to stand).
- Above mentioned disease/condition causes the bird to lie on its breast on the damp floor bedding of the chicken house (faecal contamination) and causes irritation of the leg joint and breast.

Judgement:

Condemnation of affected areas.

3.22 Dermatitis/ Gangrene Dermatitis

- Dermatitis is the inflammation of the skin.
- The onset is characterised by the appearance of small lumps on the skin.
- Could occur over a large area including the thighs, back, wings and breast.

Gangrene dermatitis:

- Affected areas appear red in colour with underlying red fluid.
- Skin tears easily.
- Feathers are dislodged easily.

Causes:

Gangrene dermatitis is also called necrotic dermatitis, skin necrosis or rotting wing. Poultry flocks suffering from Gumboro and/ or skin problems experience greater incidence of gangrene dermatitis infections. (*Clostridium spp.* could be involved.)

Judgement:

Condemn the affected parts if only the skin is affected.
Condemn the carcass if underlying parts show signs of infection.

3.23 Cellulitis

Appears as a yellow, pussy and septic lesion in the areas between the muscle tissue and epidermis.

Causes:

- When a skin infection (e.g. caused by injury) spreads to the areas between the muscle tissue and epidermis.
- Natural body resistance is low because of the low blood supply.
- Cellulitis will develop.

Judgement:

Partial condemnation of affected parts.
Total condemnation if there is an underlying infection.

3.24 Incomplete evisceration

The organs are still inside and attached to the carcass.

Causes:

- Varying bird size
- Line speed too high
- Incorrect adjustment of equipment
- Vent cut too small

Judgement:

Remove from the line for re-evisceration and rehang immediately.

3.25 Residues

History of flock must be presented with a health certificate.
Withdrawal periods must be complied with.

Causes:

Coccidiostats or antibiotics present in the carcass may pose a risk.
Presence of residues of inactivated oil emulsion vaccine.

Judgement:

Detain until laboratory results are obtained, otherwise condemn.

MEAT INSPECTORS MANUAL
POULTRY

PART II
MEAT INSPECTION

MODULE 5
DISEASES & CONDITIONS

Index

DISEASES AND CONDITIONS

DISEASES AND CONDITIONS

1. INTRODUCTION

Diseases can be caused by different kinds of organisms. These organisms include viruses, bacteria, fungi and protozoa. They will be discussed in detail in this chapter.

2. DISEASES CAUSED BY VIRUSES

INTRODUCTION

A virus is not a true cell, since it has no autonomous metabolism or life; it needs a living cell to reproduce and is therefore an obligatory intracellular parasite.

Viruses are much smaller than bacteria and cannot be seen under even the highest magnification or a normal light microscope; a special microscope called an electron microscope that is able to use very high magnifications, is used to obtain images of viruses:

2.1 Newcastle disease (NCD)

Cause

Paramyxovirus

Symptoms and occurrence

Any age birds can be affected depending on the level of immunity.
Does not usually affect humans, except if direct contact is made with the virus (laboratory or live vaccine). It will cause severe transient conjunctivitis.

Ante mortem findings

- Nervous system: paralysis of wings and abnormal behaviour e.g. twisting of the head and neck (torticollis).
- Gastro-intestinal system: Green diarrhea
- Respiratory system: Coughing, wheezing, coarse squeaking in the trachea (windpipe), excessive fluid from the respiratory tract.
- General: Loss of appetite, depression.

Post mortem findings

- Digestive tract: Intestinal inflammatory response and haemorrhaging of the proventriculus and caecal tonsils. The mucosal lining of the proventriculus is a frequent site of haemorrhage, especially at the junction between the oesophagus and proventriculus.
- Respiratory tract: Tracheitis, excess mucous secretion, haemorrhagic mucosa of the trachea, airsacs may be covered with a yellowish deposit (in cases of secondary bacterial infection). In the chronic form catarrhal inflammation of the respiratory system can be seen with oedema in surrounding connective tissue.
- General: Fever carcass, could have secondary septicaemia (*E. Coli*)

Laboratory tests together with certain symptoms are important for positive diagnosis.

Judgement

- Notifiable disease, should be reported to the nearest state veterinarian or animal health technician as soon as an outbreak is suspected.
- Birds with NCD should not be presented for slaughter (feverish carcass).
- Total condemnation if the disease is confirmed.
- Suspect carcasses should also be condemned because of notifiability.

AVIAN INFLUENZA (A. I.)

A.I is caused by various strains of influenza virus, which can be isolated in embryonated chicken eggs. In poultry the disease is known as fowl plague. Outbreaks of AI occurred in ostriches in South Africa in 1992. The virus has also been isolated from ostriches in Zimbabwe, and from other ratites in the Netherlands and the USA. Ostriches with AI show depression, green discoloration of the urine, respiratory signs and ocular discharge. Severity of symptoms and lesions depend an age and on concurrent infections with other bacteria and fungi.

Zoonotic potential: aerosol transmission
Symptoms in man: flu-like symptoms and even death.
Control: autogenously vaccine. Bio security on farm and pre-slaughter inspection.

FOWL POX

Fowl pox commonly occurs in poultry and many other avian species and is caused by several strains of avipoxvirus. In South Africa it is usually transmitted by mosquitoes during summer.

Zoonotic potential: Host specific viruses not transmissible to man.
Control: Vaccination with an autogenously vaccine and mosquito control.

2.2 Gumboro (Infectious Bursal Disease)

Cause

Birna virus

Symptoms and occurrence

- Acute, highly contagious viral infection and the primary target is the Bursa of Fabricius.
- Immuno-suppression is induced by the virus and secondary conditions e. g. gangrenous dermatitis and *E coli* infections could follow.
- Affects young chicks usually 4-6 weeks old but could also be slightly older.
- Virus extremely resistant, can survive in environment for weeks and months
- Does not affect humans

Ante mortem findings

- Birds pick at their own vents
- Depression
- White/ watery diarrhoea
- The feathers look ruffled

Post mortem findings

- Bursa of Fabricius: yellowish transudate, increase in size and weight and could be haemorrhagic.
- Dehydration, accompanied by kidney lesions
- Haemorrhages in leg and pectoral muscles

Diagnosis

- Clinical signs
- Post mortem
- Laboratory tests

Judgement

- Total condemnation in acute stage (feverish carcass).
- After acute phase only partial condemnations may be made depending on secondary *E. coli* infection.

2.3 Infectious Bronchitis

Cause

Corona virus

Symptoms and Occurrence

Any age bird can be affected.

Ante mortem findings

- Respiratory signs: sneezing, coughing, gasping and tracheal rales (abnormal respiratory sounds)
- Secondary bacterial infections

Post mortem findings

- Serous, catarrhal, or caseous exudate in trachea, nasal passages and sinuses.
- Airsacculitis and septicaemia in the case of secondary bacterial infection (*E. coli*).

Judgement

- Feverish carcass (acute stage) or secondary septicaemia – total condemnation.
- A carcass in good flesh and without systemic changes is approved.

2.4 Malabsorption syndrome (MAS)

Cause

- Multifactorial
- *Reo* virus, management, nutrition and environment

Symptoms and occurrence

- Also referred to as Runting and Stunting Syndrome or Helicopter Disease
- Affects meat type birds of 1-3 weeks old.

Ante mortem findings

- Poor pigmentation
- Ruffled feathers
- Skeletal abnormalities
- Severe growth depression

Post mortem findings

- Emaciated carcass

Judgement

- Total condemnation if emaciated

2.5 Swollen head syndrome (Dikkop)

Cause

Avian pneumovirus

Symptoms and occurrence

- Primary viral cause complicated by environmental factors (ventilation) and secondary *E. coli* infection.
- Affects young chicks.
- Incubation period 5-6 days

Clinical signs

- Swelling of the heads (sub-dermal oedema).

Diagnosis

- Laboratory tests

Judgement

- Condemn affected parts
- Total condemnation with secondary *E. coli* infection (if such complications are present).

2.6 Infectious Laryngotracheitis

Cause

Herpes virus

Symptoms and occurrence

- Recovered birds remain carriers.
- Mainly affects adult birds.

Ante mortem findings

- Sudden death in very acute cases.
- Respiratory distress including open mouth breathing, stretching of neck and coughing blood.
- Decrease in egg production
- Conjunctivitis

Post mortem findings:

- Lesions mostly restricted to the larynx and trachea
- Haemorrhages in trachea
- Necrotic plugs (pseudo-membrane) in trachea and larynx

Judgement

- Congested carcass (acute phase) – total condemnation

2.7 Marek's disease

Cause

Herpes virus

Symptoms and occurrence

- Paralysis of limbs is a characteristic symptom.
- Tumours in organs, muscle and skin.
- Not transmissible to humans.
- Birds of any age above 6 weeks may be affected (mostly between 10 – 18 weeks).
- It is transmitted by inhalation of contaminated feather follicle epithelium.
- Nerves are enlarged due to the infiltration by lymphoid cells.

Ante mortem findings

- One leg stretched forward and the other backwards
- Whole body paralysis

Post mortem findings

- The nerves leading to the legs and the wings are thickened.
- Lymphoid tumours in especially the ovaries (cauliflowerlike appearance) and other organs including muscle and skin.
- Bursa of Fabricius usually not involved.

Diagnosis

- It is made on histopathological examination of the nerves and the affected organs.

Judgement

- Total condemnation.

2.8 Lymphoid leucosis

Cause

Retro virus

Symptoms and occurrence

- Virus is transmitted via the egg and to a lesser degree from chicken to chicken.
- Important economic influence.
- B cell tumour that starts in the bursa and, before sexual maturity spreads to the other organs.
- Mature, female birds mostly affected.
- Usually seen in layers and breeders older than 14 weeks.
- Not transmissible to humans.

Ante mortem findings

- Pale, shrivelled, cyanotic comb
- Loss of appetite, dehydration and emaciation

Post mortem findings

- Grey to creamy white, soft, smooth, glistening tumour lesions (may be nodular, miliary or diffuse) in the liver, spleen, bursa, lungs, heart, proventriculus, gonads, bone marrow and mesentery.
- Emaciated carcasses.
- Enlarged liver, bursa and kidneys.

Diagnosis

- Differential diagnosis between Marek's and Lymphoid leucosis is very important for the producer.
- Histopathology.

Judgement

- Condemn the carcass.

2.9 Fowl Pox

Cause

Avian Pox Virus

Symptoms and occurrence

- Development of nodular skin lesions on the unfeathered parts of the body (cutaneous form) and/ or fibrino-necrotic lesions in the mucous membrane of the upper respiratory tract, mouth and oesophagus (diphtheritic form/ "wet pox").
- Not of public health significance.
- It is a viral disease transmitted by biting insects or through minor abrasions.

Ante mortem findings

- Cutaneous form: Small white nodular lesions that rapidly increase in size and then become yellow are seen on the comb, wattle, eyelids and other unfeathered areas on the body. Later the lesions become thick, rough and grey or dark brown. Lastly scabs form that will naturally drop off and leave a smooth scar.
- Diphtheritic form (wet pox): Nodules occur on the mucous membrane of the mouth, oesophagus or trachea. The white nodules will become yellow, cheesy, and necrotic. If the membranes are removed they leave bleeding erosions. Lastly the lesions enlarge and become covered by a dry scab or a yellow-red or brown wartlike mass.
- As a result of lesions in the mouth, a lower feed intake occurs. Therefore loss of weight also occurs.

Post mortem findings

- An emaciated and dehydrated carcass.
- Septic conditions may occur.
- Cutaneous form: lesions as described above.
- Diphtheritic form: lesions as described above.

Judgement

- The whole carcass is condemned if progressive generalised lesions in a bird are accompanied with emaciation.
- Fowls with localised lesions and recovered birds are approved after the removal of scabs.

2.10 Arthritis/ Tenosynovitis

Causes

- Virus (e. g. *Reo* virus)
- Bacteria (e. g. *Staphylococcus spp., Mycoplasma synoviae*)
- Injury

Symptoms and occurrence

- Inflammation of the soft tissue around the joint of the foot and shin
- Causes lameness and swelling

Symptoms

Ante mortem findings

- Lameness
- Swelling around joints
- Breast blisters
- Listless, dehydrated, emaciated
- Ruffled feathers
- Greenish droppings with large amounts of uric acid

Post mortem findings

- Hock joint contains straw-coloured or blood tainted exudate, which could become purulent.
- Excessive accumulation of creamy to grey fluid in the joints, synovial membranes of tendon sheaths and keel bursa in the case of *M. synoviae*
- Hepatosplenomegaly
- Degeneration of kidneys.

Judgement

Partial or total condemnation depending on degree of spreading.

3. DISEASES CAUSED BY BACTERIA

INTRODUCTION

At the end of this section you should know the condition, the bacterial species causing the condition, the poultry species involved, the organ involved, the carcass or organ judgement with reasons, and the lesions (pathology) of the organs.
Bacteria are very small, microscopic, single celled organisms and vary in size and shape. They can only be seen under the oil immersion lens of a microscope.

There are three basic shapes of bacteria:

- **Cocci** (spheres) which include:

    1. Streptococci long chains of cocci.
    2. Diplococci pairs of cocci.
    3. Staphylococci masses or clumps of cocci.

- **Bacilli:** which are rod-shaped bacteria

- **Vibrios:** which are curved bacteria.

Bacteria multiply or reproduce by direct splitting of the cells under favourable conditions of temperature, moisture and food supply.

Under adverse conditions, some bacteria (usually bacilli) may form spores that can exist for a long time.

Some bacteria can only grow in the presence of oxygen (aerobic bacteria); others only grow in the absence of oxygen (anaerobic bacteria); while some can grow either in the absence or presence of oxygen (facultatively anaerobic).

Bacteria could produce poisonous products (toxins). These are called endotoxins if they are released when the bacterium disintegrates or dies, and are called exotoxins when secreted by a living bacterial cell.

3.1 E. coli Infections

Causes

E. coli

Occurrence

Escherichia coli infections include:

1. Respiratory tract infection (Airsaculitis/ air sac disease)
2. Pericarditis
3. Coli septicaemia
4. Coli granuloma
5. Arthritis and Synovitis
6. Salpingitis
7. Coli bacillosis
8. Peritonitis
9. Omphalitis
10. Panophthalmitis
11. Swollen head syndrome
12. Enteritis

13. And all other diseases caused entirely or partly by *E. coli*

- *Escherichia coli* bacteria are commonly found in the intestines of birds, animals and humans
- If it spreads to other parts of the body, it will cause infections of different kinds.
- E coli is found in chickens mainly as a secondary pathogen especially to respiratory viral conditions
- E coli presence in water is an indication of faecal contamination
- 10-15% of *E coli* in chickens belong to potential pathogenic serotypes
- Eggs can be infected by the bacteria that enter the eggshell and penetrate the egg
- Bacteria in dusty poultry houses survive for long periods if it is dry
- A new pathogenic strain (*E coli* O157:H 7) has been isolated in humans
- It is the most common disease that will be encountered during processing

Poor management resulting from the following factors contributes to *E. coli* infections:

- Overstocking of the chicken houses
- Incorrect temperatures
- Incorrect air flow
- Not enough food and water space
- Not enough food and water supply

1. Respiratory tract infection

- *E coli* frequently infects respiratory tracts of birds concurrently infected with various combinations of different viruses etc.
- The damaged respiratory tracts become extremely susceptible to invasion by *E. coli* entering through the respiratory route.
- The resulting disease is commonly called airsac disease.
- Pericarditis and perihepatitis are often present.
- Anorexia, emaciation and death may result
- Susceptibility to airsac infection is influenced by the following factors:
  1. Socialisation, environmental stresses
  2. Inhalation of coliform contaminated dust
  3. Inhalation of chicken house dust and ammonia.
- Airsacs are thickened, with caseous exudate

2. Pericarditis

- Most *E. coli* serotypes cause pericarditis after they become septicaemic.
- It is also associated with myocarditis
- Pericardial sac becomes cloudy and the epicardium becomes oedematous and covered with a light coloured exudate.
- Pericardial sac becomes filled with a light yellow fibrinous exudate

3. Coli septicaemia

- This occurs when *E. coli* enters the blood stream
- Lesions that are seen include:

  1. Septicaemia is associated with the accumulation of yellowish-white exudate in the airsacs.
  2. May have enlargement of the liver, spleen and kidneys.
  3. Visceral serositis (inflammation of serous membranes), airsacculitis, tracheitis, pericarditis, tenosynovitis (inflammation of the tendons).
  4. Pericarditis
  5. Peritonitis

- May include all other lesions mentioned above.

- Mortality is generally not very high (less than 5%) but losses are due to retarded growth
- Mostly in broilers, turkeys and ducks
- May follow diseases such as infectious bronchitis and may be associated with malnutrition

4. Coli granuloma

- Granulomas (nodular condition) in the liver, caeca, duodenum, mesentery but not the spleen
- The granuloma may attain a large size, the condition resembling one caused by tumours.
- Necrosis involving as much as half the liver may be involved.
- The condition is caused by the reaction of tissues to chronic infection.
- After septicaemia/ blood poisoning by *E. coli*

5. Arthritis and Synovitis

- Affects the hocks and will cause pus formation
- It follows coli septicaemia
- Some birds may become emaciated

6. Salpingitis

- Inflammation of the oviduct which will result in egg peritonitis
- When left greater abdominal airsac is infected by *E. coli*, many females may develop chronic salpingitis characterised by a large caseous mass in a dilated thin walled oviduct
- This mass may increase with time
- Most die within 6 months and the others hardly ever lay eggs
- Salpingitis may follow after entry of coliform bacteria from the cloaca in laying hens

7. Swollen Head Syndrome

- Oedematous swelling of the head due to damaged capillaries.

8. Peritonitis

- Infection of the peritoneal cavity

9. Panophthalmitis

- Uncommon manifestation of *E. coli* septicaemia
- Eye becomes infected
- Complete destruction of the retina

Judgement

- Septicaemic (systemic involvement) carcasses or those with extensive lesions should be totally condemned.
- Localised infections – Partial condemnation

3.2 Staphylococcal infection

Cause

Staphylococcus aureus is responsible for most of the Staphylococcal infections

Symptoms and occurrence

- For infection to occur, the defence mechanism of the chicken has to be damaged.
- Most common site of infection is bones, tendon sheaths and leg joints.

- About 50 % of *S. aureus* strains produce toxins capable of causing food poisoning in humans.
- They are natural inhabitants (part of the natural flora) of the skin and mucous membranes and are common where poultry are processed, hatched and reared.
- Some have the potential to be pathogenic if allowed through the skin (wound) or mucous membranes (inhalation).
- After the bacteria enter through the wound/ mucous membrane they travel to an internal location where a locus of infection is established (usually close to a joint).
- In newly hatched chicks the open navel provides for a site of entry leading to omphalitis and other types of infection.

Ante mortem findings

- Ruffled feathers
- Reluctance to walk

Post mortem findings

- Synovitis (acute –inflammation of synovial membranes and tendon sheaths producing acutely swollen and painful joints) and Arthritis (more chronic – swollen joints filled with pus and fibrin deposits) are common.
- "Bumblefoot" (plantar abscess) are common and leads to massive swelling of the foot and lameness
- The disease can easily be diagnosed through isolation of the *S. aureus* bacteria.

Judgement

- Partial condemnation in chronic cases.
- Total condemnation in case of septicaemia.

3.3 Salmonella infections

Introduction

- Over 2100 serotypes exist
- Only a small number of bacteria are required to contaminate large numbers of carcasses.
- It is however necessary for the few organisms to multiply and reach an infective dose before food poisoning can take place (e.g. inadequate cooking etc.)
- Eggs become infected when contaminated with faeces and bacteria penetrating the shell.

- There are four species of *Salmonella* that are of importance in poultry, namely:

1. *Salmonella* Pullorum *(*causing Pullorum Disease/ Bacillary White Diarrhoea – BWD)
2. *Salmonella* Gallinarum (causing Fowl Typhoid)

3. *Salmonella* Enteritidis
4. *Salmonella* Typhimurium

} Paratyphoid infections

- *Salmonella* Enteritidis and *Salmonella* Typhimurium *are* zoonoses (it can be transmitted from poultry to man.)
- *S.* Pullorum (causes bacillary white diarrhoea/ pullorum disease in chicks) is seen mainly in growing chicks.
- *S.* Gallinarum (causes fowl typhoid) is seen in both adults and young growing birds.

Symptoms and occurrence

a. *Salmonella* Pullorum

- Chickens and turkeys are the natural hosts
- About one third of infected hens' eggs contain *S.* Pullorum

Pullorum disease/ Bacillary White Diarrhoea (BWD)

- Spread by true egg transmission (infected hen lays infected egg and infected chick is born to be infected for it's entire life).
- In chicks an acute systemic form occurs.

Ante mortem findings:

1. Anorexia
2. Diarrhoea
3. Pasting of vent, chalk white excreta, sometimes tainted greenish brown, in and around the vent
4. Stunted, unthrifty
5. Poor feathering
6. Pale, shrunken comb and wattles

Post mortem findings:

1. Multiple grey nodules in the heart, lungs, liver, spleen, peritonium, gizzard, intestines and pancreas
2. Rarely peritonitis, ascites or oviduct impaction
3. Swelling of the tibiotarsal joint

*(*Liver and heart lesions should be differentiated from other lesions caused by e.g. colibacillosis.)*

Judgement

Carcasses and viscera affected with pullorum disease must be condemned.

b. *Salmonella* Gallinarum

Fowl typhoid

- Becoming more common
- Septicaemic disease of domesticated birds
- Acute or chronic
- *S.* gallinarum rarely isolated from humans and has little public health significance
- Egg transmission
- Dead chicks in hatching trays.
- Decrease in general feed consumption in the house, body temperature rises and may decrease to below normal before death.
- Similar lesions as for Pullorum Disease (BWD)
- Swelling and redness of liver (bronze), spleen and kidneys.
- Pale carcass.
- Chronic stages show greenish brown to bronze and swollen livers with greyish white foci (also on myocardium). Peritonitis and pericarditis.

Judgement

Carcasses and viscera affected with Fowl typhoid must be condemned.

c. *Salmonella* Typhimurium and *Salmonella* Enteritidis (Paratyphoid (PT) infections)

- Increase in the human cases of *Salmonella* Enteritidis especially due to consumption of contaminated eggs and egg products
- Faecal carrier and shell penetration are the 2 methods of egg contamination
- Economically very important – costly to the poultry industry.
- *Salmonella* Enteritidis can produce hazardous levels of enterotoxin (cytotoxin).
- Many chickens may become symptomless excreters of *Salmonella spp.*, which will continue the cycle of infection if used as breeders, and will contaminate the abattoir when slaughtered.
- *Salmonella* Typhimurium, *Salmonella* Enteritidis and *Salmonella* Heidelberg are recognised for their pathogenic potential.
- Plastic transport crates for carcasses can be a source of contamination if the crate wash is ineffective.
- *Salmonella spp* is a common pathogen of various animal species e. g. cattle, swine, sheep, goats, dogs, cats, horses, foxes, reptiles, rats and mice (the latter indicated as carriers of especially *Salmonella* Typhimurium and *Salmonella* Enteritidis.
- *Salmonella spp* have also been recovered from insects such as flies, fleas, beetles, cockroaches, ticks, lice and mealworms.
- Humans can also spread the organism.
- Older birds or fomites (footwear, feed bags, shipping crates, or brooding equipment) may infect young birds.
- *Salmonella spp* cause many cases of food borne disease.
- The signs of *Salmonella spp* infections resemble those of pullorum disease, fowl typhoid and acute septicaemia caused by a variety of bacteria including *E. Coli*.

Ante mortem findings

- Resembles pullorum disease, fowl typhoid, avian arizonosis etc.
- Older chickens: Symptomless.
- Young chicks: Septicaemia

Post mortem findings

- None or any of the following:
- Dehydration
- Emaciation
- Pericarditis with adhesions

Judgement

Total condemnation of carcass and viscera in known and suspected cases.

3.4 Ornithobacterium rhinotracheale (OR)

Causes

- Identified in 1994 as a bacterial organism affecting poultry.
- Needs similar predisposing factors as for *E. coli.*

Symptoms and occurrence

Ante mortem findings

- Respiratory signs including eye and sinus infection, with nasal discharge
- Decrease in feed intake, poor weight gain

Post Mortem findings

- Infected airsacs have foamy appearance
- Secondary *E. coli* infection may be present

Diagnosis

- Symptoms and post mortem
- Collect samples for isolation in laboratory

Judgement

Partial or total condemnation of carcass or intestines depending on the severity of the case.

3.5 Infectious Coryza

Causes

Haemophilus paragallinarum

Symptoms and occurrence

- This is an acute bacterial condition
- It is seen mainly in adult broiler breeders and commercial layers
- Primarily affects sinuses
- No public health significance

Ante mortem findings

- Serous to mucoid nasal discharge, facial oedema (swollen)
- Severe decrease in egg production
- First signs are sneezing and blockage of the nasal opening and sinuses with an exudate – as the disease progresses the exudate becomes caseous and accumulates in the sinuses and eyes and causes the head to appear swollen.

Post mortem findings

- Acute catarrhal inflammation of mucous membranes of nasal passages and sinuses

Diagnosis

- Post mortem
- Laboratory Tests

Judgement

- Partial condemnation of affected parts

3.6 Mycoplasmosis

Causes

Most commonly:

- *Mycoplasma gallisepticum*
- *Mycoplasma synoviae*
- *Mycoplasma iowae (turkeys)*

- *Etc.*

Symptoms and occurrence *(of Mycoplasma gallisepticum)*

- Called “chronic respiratory disease” and in turkeys “infectious sinusitis”
- Little or no public health significance.

Ante mortem findings

- Respiratory rales, coughing, sneezing, nasal discharge
- Symptoms develop slowly and is of long duration
- Reduced feed intake, loss of weight, egg production declines,
- Airsacculitis is very severe
- *Mycoplasma spp* makes the body more vulnerable to *E. coli*, which is a secondary pathogen.

Post mortem findings

- Catarrhal exudate in nasal and paranasal passages, trachea, bronchi and air sacs
- Sinusitis

Judgement

- Partial condemnation
- With septicaemia total condemnation

(Also see Arthritis/ Tenosynovitis for Mycoplasma synoviae)

3.7 Pasteurellosis

- *Pasteurella multocida* (fowl cholera)
- *Pasteurella haemolyticum*
- *Pasteurella gallinarum*

Fowl Cholera

Causes

Pasteurella multocida

Occurrence

- Contagious disease affecting domesticated and wild birds.
- High morbidity and mortality.
- Mostly acute but chronic conditions also occur.
- This is a highly infectious bacterial disease seen in heavy birds and layers.
- Not generally found in broilers or chickens less than 12 weeks old.
- Recovered birds remain carriers.

Ante mortem findings

- Death may be the first indication of the disease
- Fever, anorexia, ruffled feathers, mucous discharge from mouth, diarrhoea, increased respiratory rate
- Emaciated, dehydrated
- Chronically infected or may recover
- Torticollis in chronic cases.

Post mortem findings

Acute:

- Vascular disturbances
- General hyperaemia
- Petecheal and ecchymotic lesions widely distributed
- Increased amounts of pericardial and peritoneal fluids
- Livers are swollen and contain multiple small areas of necrosis
- Ovaries of laying hens are affected due to fever

Chronic:

- Localised infections of the foot pads, hock joint and peritoneal cavity and oviduct
- Torticollis due to presence of pus in middle ear

Diagnosis

- Clinical signs and post mortem
- Laboratory tests

Judgement

- Partial or total condemnation of carcass

3.8. Tuberculosis

Causes

Mycobacterium avium

Symptoms and occurrence

- Transmissible to pigs, rarely man.
- Characterised by chronicity and persistence in a flock once established.
- Unlikely to occur in commercial flocks.
- Occurs in older backyard chickens.

Ante mortem findings

- Less lively than pen mates
- Depressed, loss of weight – especially in the breast muscle, although bird still eats well
- Breast bone very prominent and may be deformed
- Most of the body fat eventually disappears and body seems smaller than normal
- Feathers dull and ruffled
- Comb, wattles and earlobes anaemic and thin and the epidermis is dry and may also become blueish
- Sitting as a result of exhaustion

Post mortem findings

- Emaciated carcass
- Lesions in the liver, spleen, intestines and bone marrow.
- Irregular greyish white or greyish yellow nodules of varying sizes in organs such as the liver, spleen, and intestines.

Judgement

- Total condemnation
- Condemned carcass must be handled correctly in order to prevent swine from having access to the carcass.

3.9 Ornithosis/ Chlamydiosis

Cause

Chlamydia psittaci

Symptoms and occurrence

- Chlamydiosis has the following names:
  1. Psittacosis in psittacine birds (seed eaters)
  2. Ornithosis in non-psittacine birds (non-seed eaters).
- Occurs mainly in birds.
- Rare in chickens.
- It is a serious zoonosis.
- Infection usually occurs via the respiratory route.

Post mortem findings

- Enlargement of the spleen
- Fibrinous pericarditis and hepatomegaly (enlargement of liver)

Judgement

Total condemnation
Diagnosis only by a laboratory and it must be reported to the nearest state veterinarian or animal health technician.

4. DISEASES CAUSED BY PROTOZOA

4.1 Coccidiosis

Causes

Protozoan parasites of the Genus *Eimeria*

Symptoms and occurrence

- The parasites multiply in the intestines and cause tissue damage with resulting interruption of feeding and digestive processes or nutrient absorption, dehydration, blood loss, and increased susceptibility to other disease agents.
- Short direct life cycle
- Almost all young poultry are given continuous medication with low levels of anti-coccidial drugs to prevent infections or keep it to a low level
- The tissue damage in the intestines may lead to colonisation of harmful bacteria such as *Clostridium perfringens* leading to necrotic enteritis.
- The disease is transmitted by oocysts excreted in the faeces. The ingestion of sporulated oocysts infects birds.
- Coccidia could be spread by personnel who move between pens, houses or farms.
- The lifecycle is ±7 days.
- These organisms are host specific, which means that they will not affect other animal species.

- Although there are nine species of coccidia affecting domestic poultry flocks, the most important organisms are:

a. *Eimeria acervulina* (duodenum, jejunum)
b. *Eimeria maxima* (jejunum, upper ileum)
c. *Eimeria tenella* (caecum)
d. *Eimeria necatrix* (mainly ileum)

Ante mortem findings

- Bloody diarrhoea and/or watery droppings and high mortality is a definite sign of coccidiosis
- The different kinds of coccidia can be identified by taking into account the macroscopic lesions and microscopic characteristics.

Post mortem findings

- At post mortem inspection: inflammation of the intestinal tract (gut) or blood in the caeca will be an indication of the presence of coccidiosis.
- Catarrhal inflammation, petecheal haemorrhages, blood stained contents, caseous material and minute whitish or blueish foci on the intestinal wall.

Judgement

- Partial condemnation unless emaciated or anaemic.

5. FUNGI

Introduction

Fungi do not play a major role in food poisoning or spoilage under modern conditions. The one essential requirement for their development is moisture, fungi thus become important when meat is stored or transported under moist conditions. Although most fungi are retarded by cold, some species may thrive under refrigeration, which once again emphasises the importance of free air circulation during chilling, as these organisms cannot survive dehydration (drying out).

Fungi develop essentially on the surface of meat, especially that with no fat covering. They are mostly non-poisonous but they often impart an undesirable colour and odour to meat. Most fungi form spores which frequently contaminate the walls and equipment of abattoirs and chillers and thus the carcasses. The more important types of fungi that are encountered by the meat inspector are easy to identify by their colour, growing habit, etc. and include:

Contaminants:

5.1 Cladosporium spp:

- Usually occurs in carcasses held near freezing point
- Seen as black spots about ±1 cm in diameter and penetrating only some 5 mm into the meat.
- The spots cannot be wiped off and affected areas have to be trimmed off.

5.2 Sporotrichon spp:

- This is probably the most common fungal sp encountered
- Takes the form of small, white, woolly and superficial spots
- Can usually be scraped off.

5.3 Mucor and Thamodium spp

- Usually occurs in carcasses held near freezing point

- Cause a heavy outgrowth of whitish whiskers up to 2.5 cm long.

5.4 Penicillium spp.

- Causes blue- green areas of various sizes and are frequently seen on “mouldy” bread etc.
- Many mouldy areas may be simultaneously contaminated by bacteria, which give the areas a slimy appearance.
- When such contamination is of recent origin and not too advanced, trim the meat deep enough to remove the fungus growth completely, and or strip any serous membranes.
- In old cases with deep penetration it may be necessary to condemn on aesthetic grounds.

5.5 Aspergillosis

Causes

Fungus *Aspergillus fumigatus* and *Aspergillus flavus*

Symptoms and occurrence

- The primary target of the agent is the pulmonary system.
- The spores are inhaled directly after hatching.
- 2 forms occur namely acute (in young birds with high morbidity and high mortality) and chronic (occurrence not as great; in older birds).

Ante mortem findings

- Shows marked signs of difficulty in breathing (gasping and accelerated breathing).
- Conjunctivitis

Post mortem findings

- Small, white caseous nodules scattered through the lungs and plaques on air sac membranes
- The caseous nodules consist of inflammatory exudate and fungus tissue
- In very advanced stages greenish, grey mold growth can be seen on the walls of the thickened air sacs

Judgement

Condemnation of affected organs.

6. PARASITES OF POULTRY

6.1 Roundworms (Nematodes)

Symptoms and occurrence

- *Ascaridia galli* (large roundworm in small intestine). Most common. General signs of the presence of large roundworms are: Emaciation, Diarrhoea and Depression (weakness)
  Death can be caused by blockage in the intestines.
- *Capillaria* (fine thread worm). Loss of condition and catarrhal enteritis and thickening of the intestinal wall. They are in most cases microscopically small and can vary in length from 2 mm to several centimetres.
  Their life cycle can be direct; in other words from one bird to the other.
  They are responsible for considerable damage in the oesophagus and crop.
  They can also be found in the small intestine where inflammation and excessive mucus secretion is caused.

Judgement

Total condemnation if emaciated.

6.2 Tapeworms (Cestodes)

Symptoms and occurrance

- Found mainly in the small intestine.
- They consist of segments, which ripen and thereafter are excreted in the faeces.
- Poultry have to be infected by means of an intermediate host, e.g. snails, earthworms, insects, flies which eat the fertilised segments and in turn are eaten by the poultry.
- Worms are flattened, segmented, and has a head, neck and variable number of segments each of which contains reproductive organs but no alimentary tract.
- Severe wasting, toughened skin, haemorrhagic enteritis and thickening of the bowel wall is some of the symptoms of infestation.
- Signs of the presence of tape worms are: weakness; poor growth

Judgement

Total condemnation if emaciated.

7. METABOLIC CONDITIONS

7.1 Water Belly

Also known as Ascites/ ARVF (ascitis secondary to right ventricular failure)

Symptoms and occurrence

Pathogenesis of ascites

Broilers

Ascitis or fluid accumulation in the body cavity occurs as a result of the enlargement of the right ventricle of the heart in broilers, which may be due to one or more of the following factors:

a) Genetic:

Some genetic lines are more prone than others due to faster growth rate e.g. Cobb more susceptible than Ross

b) Oxygen:

i) The supply of oxygen in the initial phases of broiler rearing are less in winter due to increased heating, especially gas type burners and the closing of the brooder houses to prevent heat escaping.

ii) Altitude: Water belly occurs more often at higher altitudes than at sea level because of the availability of oxygen at sea level.

Metabolic rate has to increase to supply oxygen.

c) Feeding:

i) High energy feeding:

The starter rations of broilers in the first 21 days of life have a high kilojoule level that force the chicken into a high metabolic rate. This forces the body and thus the heart to work harder to metabolise the food.

ii) Feed formulation:

Crumbs/pellets – higher intake of feed – faster growth rate as compared to meal.
Too much salt can lead to ascites.

d) Lighting:

Chickens given 24 hour lighting for increased feed uptake and no resting period.

e) Cold

E. g. in winter the chickens will have a higher metabolic rate in order to counteract the cold.

Any one or more of the reasons result in an increase in metabolic rate and an enlargement of the right ventricle of the heart.
The increase in blood pressure causes fluid to leave the intestinal blood vessels and accumulate in the abdominal cavity.

Symptoms

- Mostly visible between 4 and 6 weeks of age in broilers.
- Increased mortality on the farm due to “flip-overs” or “heart attacks”.
- Increased DOA’s arriving at the abattoir.

Ante mortem findings

- Distended, fluid filled abdomen
- Respiratory distress
- Cyanosis

Post mortem findings

- Abdominal cavity filled with straw coloured fluid which may contain fibrin clots
- Right side cardiac enlargement due to dilation and hypertrophy
- Liver may show congestion or grey colour with enlargement and rounded edges.
- Congested lungs with oedema.
- Body shows emaciation and poor growth.

Judgement

- Total condemnation of carcass.

7.2 Femoral Head Necrosis

Symptoms and occurrence

- Characterised by lameness. Bones fracture easily when handling the chicken, haemorrhaging normally visible in these areas.

- Degeneration of the ends of the long bones, especially the femur, occurs as a result of an under supply of blood to this section of the bone.

Judgement

Partial condemnation and/ or total condemnation if accompanied by emaciation

7.3 Gizzard erosion (Black Vomit)

Symptoms and occurrence

- Caused by inferior quality fish meal (red).
- Bird appears dehydrated and pale (anaemic).
- Ulcers occur in the gizzard. As a result of the blood adhering to the ulcers the gizzard contents turns black which gives rise to the name black vomit.

Judgement

Partial and/ or total condemnation in cases of severe anaemia and dehydration.

7.4 Visceral gout

Symptoms and occurrence

- Kidney damage or dehydration
- White paste-like crystals deposited all over the organs and the surfaces of the muscles.

Judgement

Total condemnation

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PART II
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MODULE 6

MEAT INSPECTION

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MEAT INSPECTION

MEAT INSPECTION

1. INTRODUCTION

All birds presented for slaughter are subjected to an Ante-mortem and Post-mortem inspection. Before slaughtering, ante-mortem inspection is one of the essential hygiene procedures, which is carried out to ensure a safe product. This function commences on the farm in the broiler houses.

2. ANTE-MORTEM INSPECTION

2.1 Regulatory requirements

- No poultry having been treated with antibiotics, coccidiostats or any other substance that may render the carcass, viscera or organs unfit for human consumption by reason of any residues remaining therein may be submitted for slaughter unless the withdrawal period prescribed to such substance has expired.

- No bird suffering from any disease or condition that may adversely affect the meat may be slaughtered.

- Ante-mortem inspections of poultry must be done by the authorised poultry meat inspector on the day of slaughter to ensure that the necessary arrangements can be made to accommodate suspect flocks or flocks that are suffering from a disease.

- The slaughtering of poultry, affected by a notifiable disease may not be carried out without the prior permission of the authorised person.

- Poultry affected by disease, excessive soiling, varying bird size, or any other condition that may lead to contamination of other birds must be slaughtered at the end of the shift.

- Poultry that died during transportation from the farm to the abattoir, must be placed in leak proof lockable containers with tight fitting lids, which are marked with the letters "CONDEMNED" in the case of low throughput abattoirs and in high throughput abattoirs in a room provided for storage awaiting disposal, if not removed on a continuous basis.

- No dead poultry may be presented for slaughter or brought into any area where approved poultry products are handled and must be regarded and handled as condemned.

- If post-mortem examinations are performed on D.O.A.'s (dead on arrivals) to establish the reason for death, it must be performed in a special room or area with adequate facilities.

2.2 Reasons For Ante-Mortem Poultry Inspection

To ensure that:

- Only clean healthy birds are presented for slaughter and that contamination of healthy carcasses is prevented.

- Safe and wholesome meat for human consumption is made available to the consumer.

- To notify the abattoir manager in time about any disease/condition which will enable them to make the necessary arrangements to deal with the disease/condition.

2.3 Health Certification

1. No poultry may be slaughtered in an abattoir without a declaration of health status having been submitted –

   (1) in the case of a low throughput abattoir, on the day of slaughter;

   (2) in the case of a high throughput abattoir, 72 hours prior to slaughtering; and

   (3) the owner of the poultry must provide the above mentioned declaration.

2. Such health declaration must contain the following information

   (1) date of delivery;

   (2) name and address of owner/farm(s);

   (3) number of birds and specie(s);

   (4) average weight of birds;

   (5) health status of the flock(s) including mortality rate; and

   (6) medication, if given as well as withdrawal periods and dates;

2.4 Conditions Observed On The Farm And Response To It

The following disease conditions can already be observed in the broiler house on the farm and the necessary action taken:

- Obviously sick and injured poultry (to prevent cruelty to poultry) destroyed on the farm.
- Badly soiled poultry are cleaned satisfactorily before presented for slaughter.
- Diseases which are easier to observe (detect) in live poultry e.g. nerve problem cases, breathing (respiratory) diseases and fever be noted on the health certificate.
- Diseases, which pose a health, risk to humans and notifiable diseases must be reported to the state veterinarian of the province.
- Aesthetically unacceptable conditions e.g. pussy, gangrene-like lesions and cannibalism should be transported separately and handled and slaughtered at the end of the slaughtering shift.

2.5 Poultry Welfare

Animal welfare considerations are becoming increasingly more important, both in South Africa and internationally. Practices, which may once have been deemed acceptable, are now being reassessed and modified according to new knowledge and changing attitudes.

High standards of animal welfare are not only important legally, but also have direct economic benefits by enhancing productivity and helping to facilitate international market access.
(See Part 1 Module 2)

2.6 Guidelines In Respect Of Diseased Poultry Presented For Slaughter

- The abattoir management must inform, in advance, the Meat Inspector/Meat Examiner of any abnormal conditions regarding consignments of live poultry from the farms (health certification).

- The inspector must, on reception of a load of suspected diseased poultry, carry out the necessary inspection to establish the nature and extent of the disease and to determine the immediate course of action.

- The inspector must bring his findings under the attention of the abattoir management or representatives and arrange procedures for the further handling of birds.

- If diseased birds are to be slaughtered, it has to be done at the end of the shift. A space has to be left on the hanging line between the healthy and suspected, diseased or contaminated chickens, in order to perform a thorough primary and secondary examination and to remove infected parts or remove the whole chicken from the line before it leaves the evisceration area.

- Equipment, which comes into contact with the suspected, diseased or contaminated chickens, must be cleaned thoroughly disinfected and sterilised to prevent possible transmission of the disease.

- Procedures for the handling of birds for emergency slaughter must be available although seldom used at poultry abattoirs.

3. POULTRY MEAT INSPECTION

3.1 General Regulatory requirements

- All relevant information, including ante mortem and health records must be taken into consideration when doing meat inspection.

- No poultry, rough or red offal may be cut/sold/dispatched in an abattoir unless inspected and approved by a authorised person.

- No person may process a carcass or meat until it has been inspected and approved by the authorised person.

- No person may remove any sign/evidence of any disease/condition/contamination/soiling in a carcass or its viscera before inspection.

- Evisceration must be such as to expose the organs and the body cavity for proper examination by the authorised person.

- No viscera or any part thereof may be removed from any dressed poultry, prior to inspection.

- The authorised person must inspect the carcass and viscera by viewing, palpation and, if necessary, incision.

- All viscera/organs must be correlated with the carcass of origin until the final inspection is completed.

3.2 Criteria for meat inspection and judgements

If poultry, upon either ante- or post mortem inspection, is found on reasonable suspicion to be suffering from any notifiable diseases or conditions, referred to in the Animal Diseases Act, the local provincial state veterinarian must be notified immediately.

The entire carcass and organs must be condemned if –

(1) any disease is accompanied by emaciation, and/or dehydration;
(2) advanced pathological changes are observed;
(3) a condition has so spread that affected portions or organs cannot easily be separated;
(4) a disease is per-acute, acute, severe or advanced;
(5) the conditions of the carcass, meat or viscera to be aesthetically unacceptable; or
(6) contaminated

Portions of the carcass and organs must be condemned if they are –

(1) affected by disease;
(2) contaminated;
(3) severely bruised;
(4) in any other way rendered unsafe for human consumption; or
(5) soiled.

Portions of the poultry may be approved where removal and condemnation of affected parts or organs can be done. The abattoir owner must keep daily record of birds slaughtered and the amount of carcasses/ portions condemned/ or their condemned weight.

3.3 General Characteristics Of Normal Poultry Carcasses

The examination of poultry carcasses to determine whether they are normal or abnormal is accomplished by the use of the senses of sight, feeling and smell.

Indications of abnormalities of carcasses, organs or parts may include differences in size, position, colour, shape, consistency, odour or a combination of these factors.

The normal poultry carcass may vary in colour as a result of age, breed, sex, kind of feed, amount of exercise or scalding practices.

The firmness of the flesh and the colour and sheen and the tissues will depend on the age of the bird.

The head parts should not be enlarged nor should there be swellings around the eyes. The comb and wattles of normal commercial slaughtered birds may vary from bright red to pale red or even yellowish in colour.

Fowls that may have been in heavy production may have shrunken combs and the normal yellow of the beaks and shanks will have diminished or disappeared.

The skin of normal birds, which have white slate-coloured or black shanks, is usually lighter in colour than that of birds with yellow shanks. Certain breeds of birds, particularly Jersey Giants, have a greenish cast to the skin extending over the abdomen and things.

The shanks and feet of older birds will be more angular and will not appear as rounded as those of younger birds.

3.4 Requirements For The Presentation Of Carcasses For Inspection

PROCESSING REQUIREMENTS	KEY POINTS	WHY
De-feathering	An occasional feather on the occasional bird can be described to human error, however, excessive occurrence of feathers after de-feathering , is unacceptable	To expose the carcass for inspection and to facilitate the inspection of the carcass
Removal/cutting off runners	Must take place through the hock joints. Joint surfaces and tendon sheath must be clearly visible for inspection	Exposure of the tendons and joint surfaces for inspection purpose
Removal/cutting off heads	The head is removed in the "dirty" area after defeathering	Heads are edible products for human consumption and must be subjected to meat inspection
Abdominal incision	Done either by hand or mechanically, and only sufficiently to ensure the viscera are exposed and easy to remove	To avoid excessive water absorption and contamination, but still allowing for an adequate inspection
Removal of viscera	Viscera are removed from the carcass but are identified with the proper carcass	To provide the adequate view of all organs and surfaces for inspection
Positioning	All birds must come to the inspector in identical positions, including viscera, direction of hocks and direction of breasts	To permit the inspector to use of rhythmic, organised and efficient method of inspection, synchronising all hand and eye movements.
Identification	If an inspector is not responsible for all carcasses, the ones he is responsible for must be identifiable	To prevent carcasses from slipping through not inspected
Prevention of contamination of carcasses	Care and skill must be employed in the opening of the carcass so that no contamination may occur through gall or intestinal contents	To avoid contamination of wholesome, clean and healthy food for consumption by the public

3.5 Meat Inspection Points

Meat inspection is divided into 6 inspection points, which takes place at different stages of the processing process:

- ANTE MORTEM which takes place in the dirty (pre-evisceration) area at the offloading and hanging areas.
- FIRST INSPECTION POINT which is in the "dirty" (pre-evisceration) area and situated directly after de-feathering
- SECOND INSPECTION POINT which is situated in the "clean" (post evisceration) area directly after evisceration when the carcass and organs are still corresponding with one another.
- RECOVERIES takes place in an area near to the second inspection point with it's own facilities where carcasses taken off the line at the second point, can be cut and the approved parts can be utilised as portions and the rest must be condemned.
- FINAL INSPECTION POINT which is situated before the final washing of the carcass is to be done
- RETURNS are inspected in a separate room near the dispatch and with it's own facilities.

3.5.1 The First Inspection Point

The First Carcass Inspection Point is situated just after defeathering and prior to removal of heads and feet and the pre-evisceration wash.

3.5.1.1 The purpose and function of the FIRST INSPECTION POINT

- Inspection of heads and feet, which are edible products in South Africa.
- Preventing the entering of obvious diseased poultry into the evisceration section and thus the spreading of contamination by means of septic and disease contaminated parts.
- Re-hanging of carcasses which have not been properly de-feathered for re-de-feathering.
- Application of quality standards in respect of carcass selection.
- Quality control over the de-feathering- and slaughtering processes in general.
- To effectively record deficiencies for e.g. Poorly bled carcasses, machine damage, overscalded carcasses, injuries and bruising.
- To monitor the occurrence of contamination.
- To monitor the standard of hygiene during slaughtering.

3.5.1.2 Conditions recognisable at the FIRST INSPECTION POINT and action to be taken

CONDITION	DESCRIPTION	ACTION
AMMONIA BURNS	• Small to large brown discolouration of skin over breast, hocks and footpads due to wet litter. • Can become infected in which case the area will be swollen and crusty and inflamed tissue will be visible when cutting into the lesion. • May lead to "bumble feet"	1. Carcass – no action at 1st inspection point. T 2nd inspection point take off the line and partially condemn affected area in recovery area. 2. Feet – even severe ammonia burns on footpads are acceptable as long as no secondary infection is present. 3. If infected condemn feet.
ASCITES (WATER BELLY)	• Excessive accumulation of abdominal and pericardial fluid. • Carcass condition varies from normal to pot-bellied with darkened colour.	1. Remove from line at 1st inspection point and condemn carcass.
ARTHRITIS/ SYNOVITIS/ TENDOSYNOVITIS	• Inflammation and swelling of joints and sheaths of legs and feet. • Mostly the hock joint is involved. • White / yellow puss may be present.	1. Take off the line at the 2nd inspection point. 2. Take to recovery for partial condemnation.
BREAST BLISTERS	• Small to large pressure blisters on breastbone. • Visible as soft swelling on front end of the breastbone. Prone to become infected. • Small - (less than 1cm diameter) • Large - (more than 1cm diameter)	1. Leave carcass on line at 1st inspection point. 2. Carcass must be taken off the line at the 2nd inspection point partial condemnation at the recovery area.

BRUISES/ HAEMORRHAGES/ FRACTURES	• Yellow, green to purplish discolouration: during the growing stage and before the catchers arrive at the chicken houses (24 hours or longer before slaughter). • Deep red or purple discoloration: during catching, loading and transport of poultry (4 to 6 hours before slaughter). • Pink or bright red discoloration: during off-loading and hanging of poultry onto the slaughter line (2 to 15 min. before slaughter).	1. Remove from the line at 1st inspection point and condemn the carcass if more than 50% is affected. 2. If less than 50% is affected, leave on the line for 2nd inspection point and partial condemnation at recovery area.
CONTAMINATION	• Crop content contamination • Faecal contamination • Bile contamination • Pus contaminationg. • Oil contamination	1. Poultry falling off shackle lines onto the floor in the de-feathering area may be rinsed in running chlorinated water to a concentration of 50 parts per million available chlorine, or water with bactericidal levels of another approved chemical, and put back onto the line. 2. In smaller abattoirs, carcasses may be rinsed in a drum for 30 seconds with 100 parts per million available chlorine concentration. The water in the drum must be replaced regularly to avoid contamination but running water is recommended. 3. When birds fall onto or in the drainage channel under the plucker machines, they must be condemned because the water used for washing the feathers away is re-circulated water and therefore contaminated with dirt, feacal material etc. 4. If the carcass merely dropped on the floor it may be placed in the spin chiller at the bird entering point.
TORN SKIN SYNDROME/ DERMATITIS/ CELLULITIS	• Localised to extensive areas of inflammation on the skin (easily damaged by pluckers). • Becomes red, thickened and crusting of the skin appears as a result of physical, chemical and/ or microbiological factors • Generalised if more than 50% of carcass is affected.	1. If less than 50% affected take off the line at 2nd inspection point and do partial condemnation in recovery area. 2. Condemn carcasses with generalised dermatitis.
EMACIATION (as a result of not enough food or due to illness) and dehydrated carcass	• Carcass could be of normal colour to dark red-blue colour. • Muscles have wasted away and the breastbone and other bones are very prominent.	1. Remove from the line at 1st inspection point and totally condemn.
FEVERED CARCASS	• Carcass of normal or abnormal conformation but with dark red colour caused by acute infectious diseases.	1. Remove from the line at 1st inspection point and totally condemn.
OVERSCALDING	• Carcass has a boiled or par-boiled appearance depending on time and temperature of exposure. • Breast muscle has a deep white appearance. • Skin is pliable and damage is often seen caused by the pluckers. • Occurs normally after the line has stopped.	1. If severely overscalded remove from the line and condemn. 2. If scalding is done by hand, - partially condemn at recovery. 3. Test at 2nd inspection point by cutting into meat – 2 mm 4. If deeper than 2 mm – totally condemn 5. If less than 2 mm – partially condemn.
PLUCKER DAMAGE (machine damage)	• Damage caused by improper plucker setting, rubber finger maintenance, abnormal sized birds, skin weaknesses caused on farm and overscalding. • Visible as the skin tears and fractures and dislocation of joints especially wing joints without bleeding into surrounding tissues.	1. If more than 50%, take off at 1st inspection point and totally condemn. 2. If less than 50% is affected leave on line for 2nd inspection point and total condemnation or partial condemnation at recovery area.

POOR DEFEATHERING	• Carcasses with feathers that could not be readily removed by pinners	1. Remove from the line at 1st inspection point and rehang before pluckers if possible 2. If not possible total condemnation.
POORLY BLED	• Bright red discolouration of whole carcass. • Neck flap shows bright to dark red • Wingtips shows bright to dark red.	1. Remove from the line at 1st inspection point and totally condemn the carcass. 2. Leave on line if only neck flap displays a bright red discoloration.
SMALL CARCASS	• Small but normal conformation and colour. • Must not be confused with emaciated diseased carcasses.	1. Approve.

3.5.1.3 Inspection procedures in respect of the FIRST INSPECTION POINT

(1) The whole carcass, including the head and feet, must be inspected;

(2) Only carcasses that will be totally condemned must be removed from the line, trimming of carcasses must not be done at the First Inspection Point;

(3) Where trimming has to be done, carcasses must remain on the line and trimming to be done at the detention and recovery area;

(4) Carcasses coming into contact with re-circulated, contaminated water used for the conveyance of feathers, are unsafe for human consumption and must be totally condemned; and

(5) Carcasses accidentally coming into contact with the floor may be recovered by rinsing the carcass under running potable water containing bactericidal levels of a chemical approved by the National Executive Officer for the use on foodstuffs.

The meat examiner/inspector must, when inspecting a carcass and its organs, give special attention to –

(1) state of nutrition;
(2) completeness of bleeding;
(3) trauma;
(4) evidence of disease/condition;
(5) colour;
(6) odour;
(7) consistency;
(8) conformation; and
(9) any other abnormalities.

3.5.1.4 Duties of the meat examiner at the FIRST INSPECTION POINT

Manning the first carcass inspection point and performing meat inspection.

3.5.2 Second Inspection Point

The Second Inspection Point is situated after evisceration and the pack is asociable with the carcass.

3.5.2.1 The purpose and function of the SECOND INSPECTION POINT

- The inspection of the carcass and its intestines.
- The removal from the line for total or partial condemnation.

3.5.2.2 Conditions recognisable at the SECOND INSPECTION POINT and action to be taken

POULTRY MEAT INSPECTION (Some conditions recognisable at the SECOND INSPECTION POINT) (Post evisceration)		
AIRSACULITIS	• Inflammation of airsacs in the chest and abdomen visible as white / yellow cheesy deposit on the membranes in the chest and abdomen due to bacterial infection. • Lumps of cheesy material are often the only visible sign.	1. Take carcass to recovery. 2. Condemn the organs that are affected.
BREAST BLISTERS	• Small to large pressure blisters on breastbone. • Visible as soft swelling on front end of the breastbone. Prone to become infected. • Small - (less than 1cm diameter) • Large - (more than 1cm diameter)	1. Leave carcass on line at 1st inspection point. 2. Carcass must be taken off the line at the 2nd inspection point for recovery.
FATTY LIVER SYNDROME	• Occurs in laying hens. • The liver appears pale and friable due to the accumulation of fat in the liver cells. • Haemorrhages in the liver could occur. • Liver may rapture, with the accumulation of blood in the intestinal cavity and death of the bird.	1. Partial or total condemnation of the liver depending on the extent of the fat deposit
HEPATITIS	• Normal to enlarged liver with haemorrhages or abnormal discolouration and spots due to various infectious and non-infectious causes. • Not to be mistaken for light brown liver due to excess fat accumulation.	1. Take off line at 2nd inspection point and take carcass to recovery. 2. Condemn affected organs.
PERICARDITIS	• This is an inflammation of the heartsac. • It can be thickened or covered with a cream coloured fibrous membrane. • In severe cases the membrane might be attached to the heart and may affect the function of the heart.	1. Take off line at 2nd inspection point and take carcass to recovery. 2. Condemn affected organs.
PERIHEPATITIS (Inflammation of liver membranes)	• Normal to enlarged liver with white / yellow cheesy deposition outer surface due to bacterial infection.	1. Take off line at 2nd inspection point and take carcass to recovery. 2. Condemn liver.
PNEUMONIA / PLEURITIS	• Inflammation of lung or lung membrane visible as white / yellow cheesy material in or around the lung.	1. Take off line at 2nd inspection point and take to recovery. 2. Condemn affected organs.
POLI-SER0CITIS/ COLI-SEPTICAEMIA	• Septicaemia is associated with the accumulation of yellowish-white exudate in the airsacs. • May have enlargement of the liver, spleen and kidneys. • Visceral serositis (inflammation of serous membranes), airsacculitis, tracheitis, pericarditis, tenosynovitis (inflammation of the tendons). • Pericarditis • Peritonitis	1. Total condemnation of carcass and organs.

ARTHRITIS/ SYNOVITIS/ TENDOSYNOVITIS	• Inflammation and swelling of joints and sheaths of legs and feet. • Mostly the hock joint is involved. • White / yellow puss may be present.	1. Take off the line at the 2nd inspection point. 2. Take to recovery for partial condemnation.
GUMBORA	• Bursa of Fabricius: yellowish transudate, increase in size and weight and could be haemorrhagic. • Dehydration, accompanied by kidney lesions • Haemorrhages in leg and pectoral muscles	1. Total condemnation in acute stage (feverish carcass). 2. After acute phase only partial condemnations may be made depending on secondary *E. coli* infection.
PERITONITIS	• Inflammation of the peritonium.	1. Take to recovery for partial condemnation.
TORN SKIN SYNDROME/ DERMATITIS/ CELLULITIS	• Localised to extensive areas of inflammation on the skin (easily damaged by pluckers). • Becomes red, thickened and crusting of the skin appears as a result of physical, chemical and/ or microbiological factors • Generalised if more than 50% of carcass is affected.	1. If less than 50% affected take off the line at 2nd inspection point and do partial condemnation in recovery area. 2. Condemn carcasses with generalised dermatitis.
CONTAMINATION	• Crop content contamination • Faecal contamination • Bile contamination • Pus contamination • Oil contamination	1 If any contamination is visible at the second inspection point, the carcass must be removed and trimmed at recovery. 2 If more than 50 % of the carcass is affected, the carcass must be condemned.

3.5.2.3 Inspection procedures in respect of the SECOND INSPECTION POINT

Inspection procedures at the Second Inspection Point:

(1) Hock joints and skin surface must be observed;

(2) Observe the back of the carcass;

(3) Observe the wings, legs, thighs and breast;

(4) Inspect by observation the body cavity, air sacs, lungs, heart, liver, spleen, gizzard, intestines, cloaca and bursa; and

Depending on the judgement, the following may be done with the carcass, organ or meat:

(1) Approved for human or animal consumption;

(2) Partially approved;

(3) Conditionally approved; or

(4) Condemned totally.

3.5.2.4 Duties of the meat examiner at the SECOND INSPECTION POINT

Manning of the “second” carcass inspection point and doing physical inspection of the poultry carcasses and organs.

3.5.2.5 Recovery

Where carcasses require partial condemnation as a result of a minor localised lesion and this condition is of such a nature that it holds no meat safety risk the quality controller may do the necessary trimmings and partial condemnation at the portioning section and approve of the rest of the carcass or viscera.

Carcasses that require removal from the line, due to conditions that hold a meat safety risk and renders it unsafe for human or animal consumption, such detained carcasses must be kept apart from healthy carcasses.

Trimming and recovery of portions that can be approved for human and animal consumption, must be:

(1) done in a separate room/area as prescribed;

(2) done by an authorised meat examiner;

(3) washed under running chlorinated water;

(4) chilled; and

(5) utilised as a frozen product only.

3.5.2.6. Final inspection

The purpose and function of the FINAL INSPECTION POINT

- The inspection of the carcass for contamination after harvesting.
- The removal from the line for total or partial condemnation.

3.5.2.2 Conditions recognisable at the FINAL INSPECTION POINT and action to be taken

POULTRY MEAT INSPECTION (Some conditions recognisable at the FINAL INSPECTION POINT) (Post harvesting)		
CONTAMINATION POOR PACK HARVESTING	• Crop content contamination • Faecal contamination • Bile contamination • Pus contamination • Oil contamination • Part of intestines	1.If any contamination is visible at the final inspection point, the carcass must be removed and trimmed at recovery. 2.If more than 50 % of the carcass is affected, the carcass must be condemned 3. Re-hanging for effective removal of organs or intestines.

3.5.2.3 Inspection procedures in respect of the FINAL INSPECTION POINT

Inspection procedures at the Final Inspection Point:

(1) Hock joints and skin surface must be observed;

(2) Observe the back of the carcass;

(3) Observe the wings, legs, thighs and breast;

(4) Inspect by observation the body cavity, air sacs, lungs, heart, liver, spleen, gizzard, intestines, cloaca and bursa; and

Depending on the judgement, the following may be done with the carcass or meat:

(1) Approved for human or animal consumption;

(2) Partially approved;

(3) Conditionally approved; or

(4) Condemned totally.

3.5.2.4 Duties of the meat examiner at the FINAL INSPECTION POINT

Manning of the "final" carcass inspection point and doing physical inspection of the poultry carcasses.

3.6 Inspection Of Returns

The handling of "returns" often is a critical process because, the product being handled will already be in a sensitive state either because of expired sell by dates, breaking of the cold chain or the exposure to contaminant situations.

To minimise the possibility of contaminating the processing areas, these products must be handled in a secured manner before the recovered portions can be re-introduced into the process to be frozen after de-contamination (washed in chlorinated or Trisodium Phosphate treated water or water with bactericidal levels of an approved chemical).

Regulatory Requirements

Inspected and approved poultry carcasses that have left the abattoir may be returned to the abattoir for re-inspection and re-packing, provided:

- An area/room or approved facility is available for the handling of "returns";
- It may only be wrapped and packed whole carcasses
- It may not be frozen blocks of :mala" including intestines, gallbladders, heads and feet
- The re-introduced product is examined by the authorised person on arrival, and found to be free of any signs of contamination or spoiling and to be unconditionally fit for human consumption;
- Any poultry carcasses, parts thereof or offal brought into an abattoir and found to be contaminated, spoiled or unsafe for human consumption, must be condemned;
- The wrapping still bears the original marking of the abattoir of origin, no unmarked products may be accepted.
- On receipt the temperature of products is between minus 1 and 7 °C. Any product above this temperature may not be accepted. Proof of maintaining the cold chain must be provided (Thermo-graphs etc).
- The director may impose any additional hygiene requirements in respect of facilities and procedures of cutting-up, packing, cooling, storage and transportation.
- No imported poultry meat may be handled in an abattoir without the written approval of the Provincial Director Veterinary Services.
- It is only utilised for frozen products
- No offal is accepted
- Movement or re-introduction of poultry meat, carcasses, parts thereof and red offal between an abattoir and further processing plants is permitted, provided that the requirements for transport of meat are adhered to.
- No poultry meat from foreign countries may be handled in an abattoir

A room for the recovery of returns should comply to the following minimum standards:

- Such a room must comply with the normal structural requirements of abattoirs.

- The receiving area for these "returned" products must have a pre-receiving area where obvious contaminated/ adulterated products can be sorted and removed.

- The receiving area must be connected to the recovery area via a hatch only.

Facilities needed in this room:

- Hand wash facilities and washing facilities with hot and cold water for the washing of equipment must be provided.
- Sterilisers for sterilising equipment and hand tools used in this area at a temp of 82 °C.
- Acceptable equipment for the purpose of re-inspection and salvaging of the returned carcasses.
- Lockable, properly marked containers for condemned material.
- A small spin chiller at < 7°C with a constant replacement of chilled water with a chlorine content of 50 p.p.m. free chlorine or bactericidal levels of an approved chemical.
- Adequate lighting is essential, minimum of 540 Lux is required.
- Bins for disposal of packing and wrapping material must be available.

Returns may include:

- Fresh products which "Sell-By" or "Use-By" -date have expired.
- Products of which the wrapping or packing was damaged during transport.
- Cancelled orders due to over supply, etc.

Products originating from further processing plants and other slaughtering facilities

- Movement and re-introduction of poultry meat, carcasses and giblets between an abattoir and its further processing plant belonging to the same owner and/or company is permitted, provided that:

  (a) A veterinary public health officer or designated official is stationed at the plant concerned
  (b) Regulations for transport are adhered to.

- Products from another abattoir although belonging to the same owner or company are not permissible. Each abattoir must have its own area for the handling of returns.

Control over the re-inspection area

- This is considered a high-risk area. A qualified poultry meat inspector must examine the re-introduced product.

- Record keeping of numbers/ weights of carcasses/ portions to be kept of all returns.

- Record keeping of recovered and re-approved carcasses and portions.

- Record keeping of disposal of condemned products.

- All giblet and red offal returns will be considered as unfit for human consumption and must be condemned and destroyed.

- Temperature control of less than 12°C in the receiving and re-packing area.

4. POULTRY MEAT INSPECTION COMPONENT

4.1 Duties Of A Poultry Meat Inspector

Work area

The whole abattoir and processing plant, including any other activities that might take place including farm visits.

Duties

- Monitoring the security system of approval and packaging material stickers.
- See that compliance with the Registration Certificate is carried out.
- See that compliance with the Meat Safety Act, Act 40 of 2 000 is carried out.
- Monitoring the poultry meat examiners manning the first and second carcass inspection points.
- Other aspects of HMS as decided by management.

4.2 Proposed Recommended Meat Inspection Component For Poultry Abattoirs

The number of inspectors will be determined by the line speed and health status of the livestock being slaughtered,

4.2.1 High Throughput poultry abattoirs

Involvement of a veterinarian

It is the prerogative of the abattoir owner to employ a veterinarian on a full-time or on ad hoc basis.

A designated veterinarian should however be available for /to do:

- Ante- mortem inspection, liaison with farm managers and the issuing of health Certificates.
- Interpretation of laboratory test results
- Post-mortems on DOA's, mortalities and poultry not fit for slaughter with written reports to the abattoir manager/processing manager.
- Notify authorities of outbreaks of notifiable diseases.

Provincial Veterinary Government

The Veterinary Authorities of a province may specify the maximum rate at which poultry in an abattoir may be slaughtered if insufficient meat examiners are available.

The Veterinary Authority of a province may require additional meat inspectors/examiners after having considered:

- the abattoir design
- number of inspection stations
- line-speed
- different type of poultry
- structural and managerial aspects.

4.2.2 Low Throughput poultry abattoirs

Involvement of veterinarian

Ad hoc veterinarian involvement is to be encouraged.

4.2.3 Guideline for the determination of the minimum number of meat examiners required

GRADE	FIRST INSPECTION POINT	SECOND INSPECTION POINT	RECOVERY	FINAL INSPECTION POINT	TOTAL
A	1 + R	1 + R	1 + R	1+R	8
B	1 + R	1 + R	1 + R	1+R	8
C	1	1	1		3
D *	1				2
E *	1				1

The figures mentioned are per line per shift. The supervisory meat inspector can however supervise more than one line. The recovery area needs a minimum of one examiner but may require more depending on the quantity of recoveries. The meat examiners may only do meat inspection under the supervision of the meat inspector.
(*In the D and E grade abattoir, one examiner can do meat inspection at both the inspection points if these functions are carried out at different times.)